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The Welding Engineer

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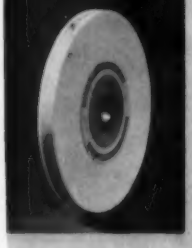

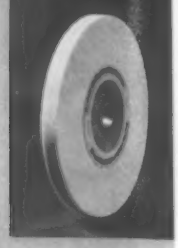

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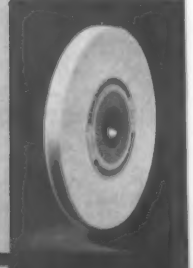

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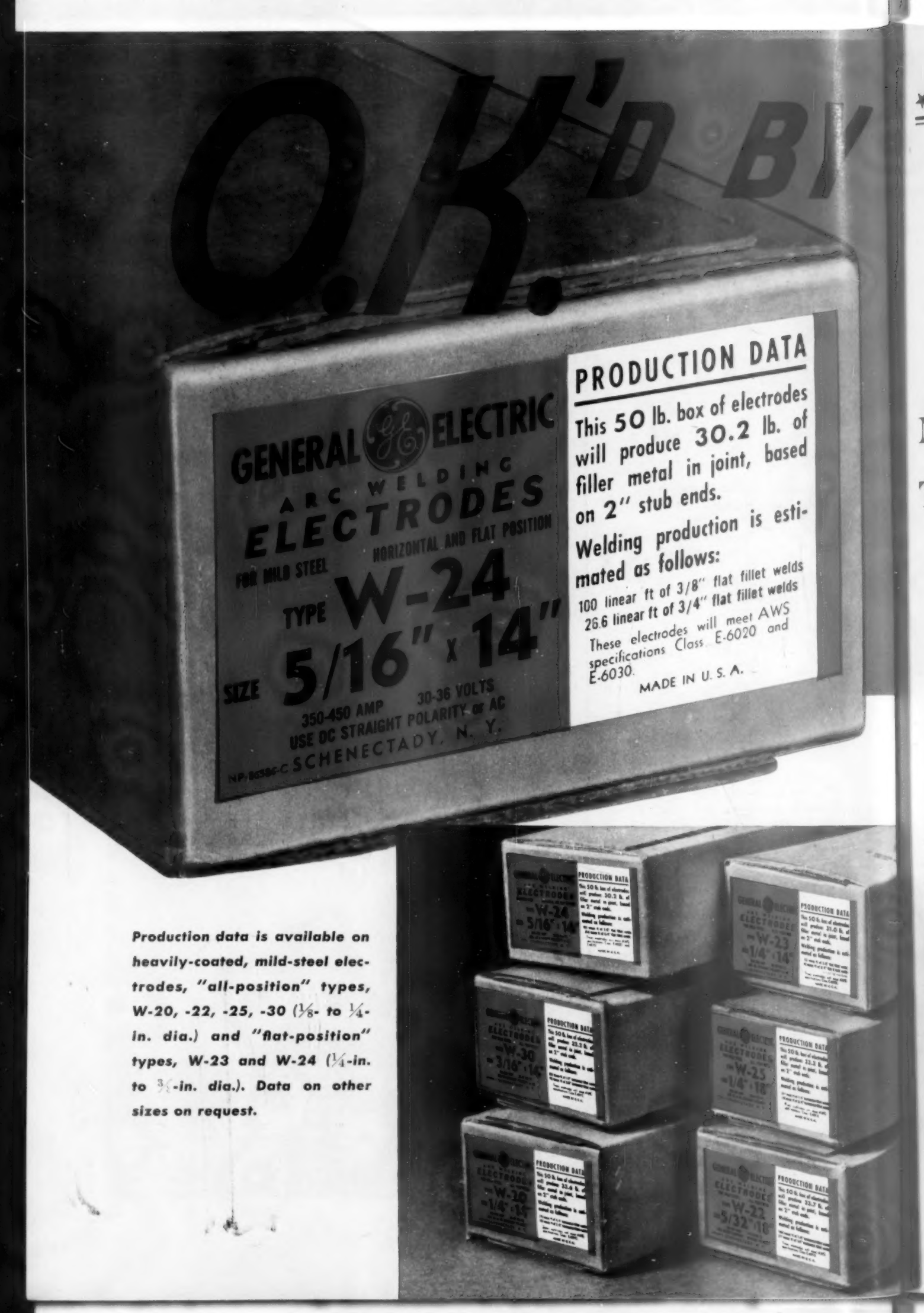
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Finished tank car made of nickel-clad steel at Milton, Pa., plant of American Car and Foundry Co.

Nickel-Clad Tank Cars of Welded Construction

By
T. E. DEPEW

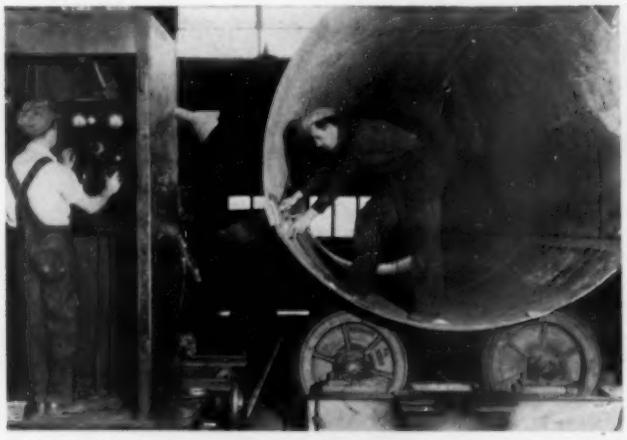
The ability of welding to withstand temperature changes and constant vibration makes it an ideal means for fabricating railroad equipment. The newest application of welding is in the fabrication of nickel-clad steel tank cars.

ACTUATED by the belief that the use of welded rather than riveted tank car construction will generally cut down maintenance cost, the American Car and Foundry Co., Milton, Pa., is building five all-welded nickel clad steel tank cars. These cars are the first all-welded units of this material and as such will mark a new development in railroad transportation.

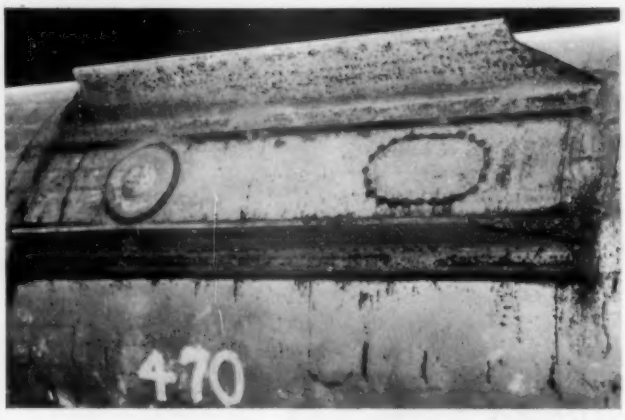
Nickel welding the interior of the dome

These cars are designed specifically for carrying a variety of chemicals and other products whose color and purity must be protected against metallic contamination. One way to obtain this protection is to line the interior of the car tank with nickel so that they could carry phenol solvents, a wide range of alkalies, syrups and the like, without danger of metallic contamination to the commodity or corrosion of the nickel. Previous experiences had proved that a nickel lining having a minimum thickness of 0.025 in. would do the job. Also by using a nickel-clad steel it is possible to build a container with the corrosion resistant qualities of nickel though the cost of the material used is nearer that of steel. The nickel-clad layer is rolled directly on to the steel in such a manner as to form a permanent bond, thus avoiding the disadvantages of a plated or loose lining.

In the past, nickel-clad cars of this type have been built using riveted construction. It was found, however, that in some cases where liquids have been loaded in riveted cars at relatively high temperatures—around 600 F.—this heating and cooling cycle has resulted in loosening the rivets with the result that the outer shell and insulation must be removed and the loosened rivets replaced. With welded construction, it has been determined that the joints are stronger even than the parent metal, and since nothing in the tank can loosen, either from temperature variations, or constant vibration, maintenance on a welded car will be much less.



Making X-rays of the welds in accordance in I.C.C. requirements.



Type of welded-on anchor developed for new cars by American Car and Foundry Co. This anchor is welded to the outer steel surface and bolted to the frame.

These new cars embody many structural features new to rolling stock design. Each tank is over 32 ft. long and mounted on a standard truck. The diameter is 86¼ in. and the heads are flanged and dished. Fittings are either of pure nickel or are lined with pure nickel sheet. Tank capacity is 10,000 gal. All tank seams were automatically welded by the submerged melt (Unionmelt) process on the outside, while interior of the butt joints were welded manually with pure nickel electrodes to provide a complete all-nickel lining.

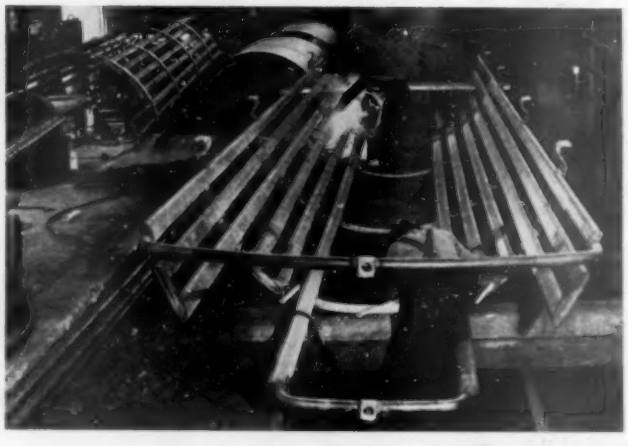
In welding, the plates were first bevelled on the steel side. This was followed by fitting the plates together, tacking, and automatically welding on the steel side. The joints on the nickel side were then chipped to remove any unwelded steel and to obtain a clean uniform groove into which two layers of nickel weld were deposited by electric arc welding. All welds were x-rayed to meet the strict specifications of the Interstate Commerce Commission.

Special furnaces have been built at the Milton plant in which the tanks, before mounting on the trucks, are annealed to relieve whatever stresses might have been set up by forming or welding.

The cars are provided with six inches of spun glass insulation contained in an outer casing of steel. They are also fitted with steam heating coils buried within the insulation and contacting the exterior of the tank so that the lading can be heated, if necessary, for easy emptying. For mounting the tanks of the trucks, American Car and Foundry engineers developed a special type of anchor. This is welded to steel side of the nickel clad tank and bolted to the car frame in the center. Specially fashioned wooden cradles support the tanks at both ends.

The placing of the new all-welded nickel-clad tank cars into service comes as part of a general trend towards the use of corrosion-resistant metals for transportation purposes. An earlier indication of this trend was the construction several years ago of the 4,000 t. caustic-tanker Dolomite 4, now renamed the "Nickeliner." The holds of this vessel were completely lined with nickel. There also is evidence of a tendency to use metals rather than sprayed or painted-on surfaces for protection against corrosion and contamination because of the greater durability and lower maintenance costs of the metal.

THE END



Welding the heating coils through which live-steam from locomotive or plant system can be passed to facilitate unloading of the lading when required.

Heating coils are fastened around the bottom of the steel side of the tank. Tanks and coils later are packed with spun glass insulation six inches thick except where thickness of coils reduces insulation to 4 inches. An outer steel jacket is then applied.

The New Oscilloscope—an Aid to Good Resistance-Welding*

By

L. G. LEVOY, JR., and C. H. SCHERMERHORN

Industrial Engineering Dept., General Engineering Laboratory
General Electric Company

The development of this new magnetic oscilloscope should be of considerable value in checking the operation of resistance-welding controls, in trouble shooting, and in making installation adjustments.

THE widespread use of resistance welding has created a need for instruments which are particularly applicable to this art. At first, ordinary instruments already available were used or modified for use. Most of these conventional indicating instruments were limited in speed or response by their mechanical system and were not entirely satisfactory for the observation and measurement of the very short pulses of current or very short dips of voltage which are characteristic of resistance-welding operations.

The need for an oscilloscopic type of instrument has been felt for some time. The cathode-ray type of oscilloscope has come into very general use and is a very useful tool for many classes of work. However, the ordinary cathode-ray oscilloscope is affected by the stray magnetic fields frequently found in the neighborhood of resistance-welding machines. These fields distort the trace and affect its calibration. Also, such a cathode-ray oscilloscope is primarily a voltage responsive device and currents must therefore be translated into voltages for observation. While these difficulties can be overcome, it is not the simple and straightforward procedure desirable.

The ideal instrument for the purpose would therefore be one that is free from stray-field disturbances, that will respond to current and voltage with equal facility, that is also sturdy, of light weight, readily portable, simple to set up and adjust, and easy to operate. Since it was found that most ordinary resistance-welding problems do not require any time-axis motion or photographic features, it was felt that a magnetic type of oscillograph in which these features were omitted, and further simplification of design and reduction of size effected, would fulfill the requirements of the application under consideration. Accordingly, along this line of procedure, there was developed the new type of oscilloscope described in this article.

No other instrument fulfills as effectively the purpose for which this oscilloscope was designed.

After the following description of the instrument, some typical applications in the field of resistance welding will be explained.

New Oscilloscope

The new instrument is designed to indicate peak values of current or potential; and these are observed directly on the viewing screen. It has high-speed response so that all current or voltage peaks are visible, even when seam welding, and it requires no reset time. It is almost free from interference by stray magnetic fields.

In Fig. 1 is shown a view of the instrument which, because of its operating principle, is designated as The Magnetic Oscilloscope. It utilizes a small permanent magnet type of oscillograph galvanometer and is adapted to a wide range of currents or potentials. A narrow light beam from an internal lamp impinges upon the galvanometer mirror, and is reflected to the ground-glass screen. Thus small motions of the galvanometer mirror are observed as a horizontal trace of light on the screen, as later shown in the lower part of Figs. 6 and 7. Using a light beam in this manner to magnify the motion without introducing appreciable mass makes possible the high-speed response characteristic of this type of instrument. While the instrument is primarily a peak-reading device, it is also possible to observe wave shapes under certain conditions as will be explained later.

For most purposes, it will be sufficient to observe magnitude, symmetry, and uniformity of the current wave, all of which can be readily accomplished with the instrument. These characteristics of the wave are

*Reprinted from G-E Review, July, 1941.

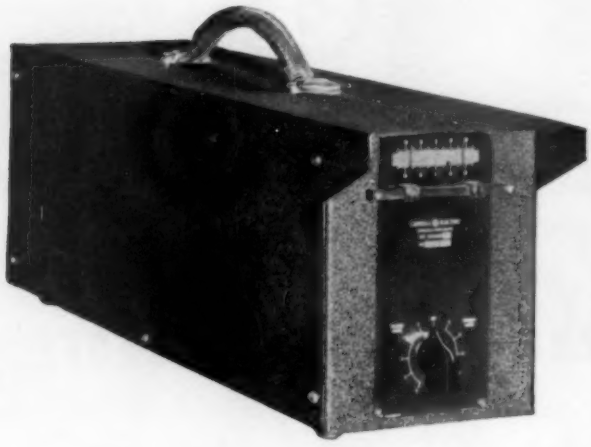


Fig. 1 — The magnetic oscilloscope, with range-selector switch, viewing screen, and adjustable markers on the front panel, and hood that shields the screen from extraneous light.

revealed by the length, position, and uniformity of the deflections of the light beam on the scale. The adjustable markers on the scale assist in determining the end points of the deflections. It is easily possible to observe current pulses of 1 cycle or even ½ cycle of a 60-cycle wave. All controls are located on the front panel within easy reach of the operator.

Double Filament Lamp

Figs. 2 and *3* show the oscilloscope with its cover removed. All its parts are then readily accessible. It is not ordinarily necessary however to remove the cover because the zero adjustment and all other normal adjustments and connections are made externally. The lamp is a double-filament automobile headlamp, either filament of which may be used. When one filament burns out, the lamp can be turned and the other filament used. Thus the light source has a long life and a low replacement cost.

In *Fig. 4* is shown a diagram of the internal circuits of the instrument. It will be noted that the lamp source is energized from a step-down transformer which will operate from any 110-volt 50/60 cycle a-c source. Current or potential connections to the circuit under observation are made to the binding posts located on the rear panel. The circuits are so arranged that no damage will result if the range-selector switch is accidentally turned to the current position when the instrument is connected to read voltage.

The range of the instrument can be conveniently extended to observe very high alternating currents, such as are frequently encountered in resistance welding applications, by using a current transformer of the type shown in *Fig. 5*. With the aid of this device, it is not necessary to break into the circuit to observe current, but merely to clamp the transformer around the current-carrying member after connecting the transformer's secondary leads to the current terminals of the instrument.

Experience with the magnetic oscilloscope has indicated that it is a very valuable aid to good resistance welding. It supplements the numerous other instruments which are now being used. Each of these has a field of application and the oscilloscope covers certain applications for which other types of instruments are not well suited.

Because the operating principle of the oscilloscope described renders the instrument practically immune to the disturbing effects of stray fields, the instrument is especially valuable for observation of electrical quantities in the vicinity of intense magnetic fields.

Applications

With it can be observed currents or voltages of such short duration that reliable information about them cannot be obtained by ordinary indicating instruments because of their relatively slow response mechanisms. Since observations of this nature are frequently desirable in connection with a-c resistance welding operations, a few examples of the use of the oscilloscope in this field will be described.

Some of the specific applications are:

(*1*). Checking the operation of electronic controls.

(*a*). Symmetry of current waves.

(*b*). Uniformity of current waves.

(*2*). Adjustment of the starting angle of the control to correspond with the power-factor angle of the welding machine.

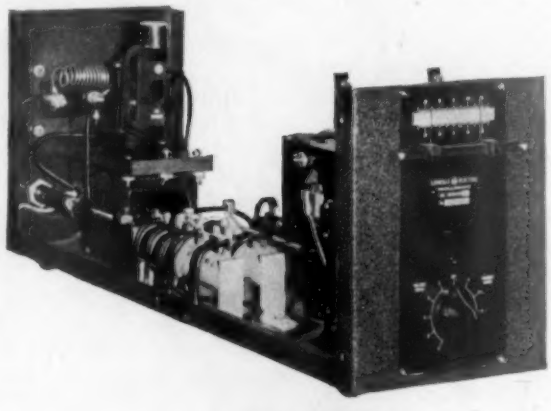


Fig. 2—Front oblique view of the oscilloscope with cover removed. On the front panel is shown the range-selector switch, the ground-glass screen and its adjustable markers. At the rear is shown the galvanometer, and above it the zero centering adjuster, behind it the coiled shunt, and beneath it the lamp transformer.

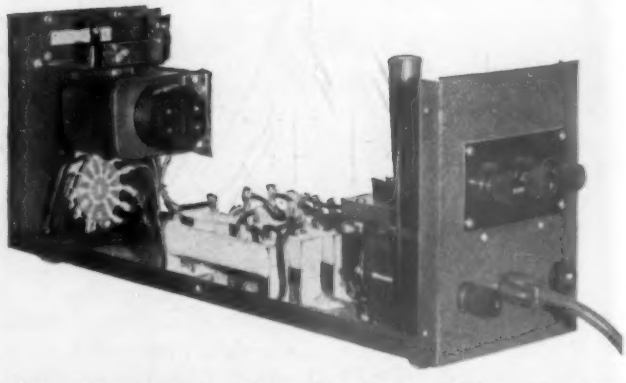


Fig. 3—Rear oblique view of the oscilloscope. On the near panel is a group of three binding posts for connection to the current or voltage being observed, and beneath them the binding post for grounding the instrument case, the connection plug for the lamp, and the fuse. The tapped resistors for range selection are midway between the end panels. On the far panel is shown the lamp housing, with the adjustable slit in front of it and a cylindrical lens above it.

(3). Adjustment of the full-wave setting on the control of phase-controlled welding machines to correspond with 100 per cent "heat" setting on the control dial.

(4). Current measurement (full-wave only) for very short "on" intervals.

(5). Voltage regulation measurement.

(6). Observation and measurement of magnitude of starting transients on nonsynchronous welding control.

(7). Monitoring current measurements made with pointer-stop instruments.

Utilizing corresponding item numbers for identification, the details of these applications will now be outlined.

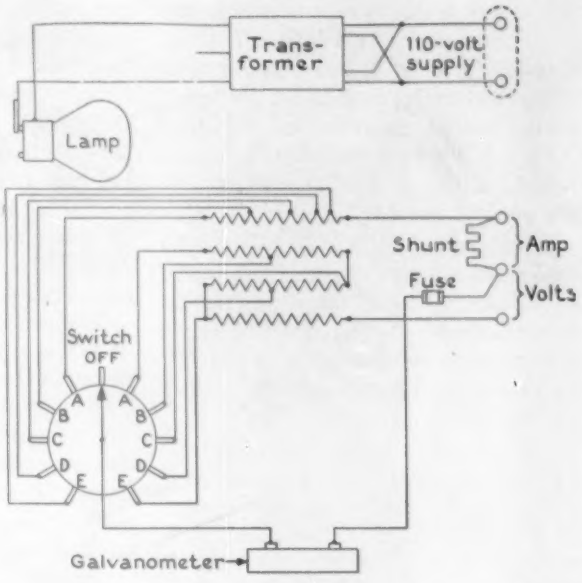


Fig. 4—Internal circuit connections of the oscilloscope.

Details of the Applications

Whenever current is being measured or observed on large welding machines, a clamp-on or split-core type of current transformer of the proper ratio is used in conjunction with the oscilloscope. The ratio of this transformer should be such that the current to the instrument will be large enough to give adequate deflection, but should never exceed the rating of the instrument. In general, satisfactory observations can be made if the current transformer ratio is such that the current in the circuit under observation, divided by the ratio, falls between 5 and 20 amp. The duty cycle at any current to which the instrument shunt is subjected should never exceed the thermal equivalent of 5 amp rms continuously. In the following explanations, it will be assumed that such a transformer is used when making current observations.

(1). When a resistance-welding machine does not function properly, the question often arises as to whether the trouble is in the electronic control or in some other part of the equipment. Frequently, this question can be answered by observing the current wave alone. Synchronous electronic control of a-c resistance welding is functioning properly when it provides symmetric and uniform current waves. Conversely, if the control does not provide such waves it is not functioning properly. This test of wave characteristics will indicate not only the proper or improper functioning of the control but also the presence of a defective or hard-starting power tube, since such a tube will cause the current wave to be either asymmetric or nonuniform, or both. Furthermore, if only one power tube is bad, the polarity of the disturbance will indicate which tube is defective. The relative polarity can be established by firing the leading tube for ½ cycle and noting the direction of deflection of the instrument. When multi-cycle spot welding, a late-starting or missing trailing tube will cause excessive current in the leading tube. A late-starting leading tube will cause high currents in the trailing tube. Both cases result in asymmetry and probably some irregularity of current wave.

This test for uniformity and symmetry of current wave is quickly and easily made with the magnetic oscilloscope and will serve not only to assist in trouble-shooting work but also in checking new control installations to insure proper operation.

(2). For full-wave synchronous controls, the starting angle should be adjusted to correspond with the power-factor angle of the welding machine. This adjustment is characterized by symmetry of the current wave. The control is first adjusted for a short spot, such as one cycle, and the current wave observed. If the leading-tube side of the current wave is larger than the trailing-tube side, the control is firing too early (ahead of the power-factor angle) and the firing should be retarded until symmetry is observed. Likewise, if the trailing half cycle is larger than the leading half cycle, the control is firing too late and the firing point should be advanced until symmetry is obtained.

When such a control is improperly adjusted, the resulting asymmetrical wave may for example be like that shown in the upper part of *Fig. 6*. Beneath it, the line *a b* illustrates the appearance of the trace of this one-cycle current as viewed on the oscillo-

Fig. 5—Split-core clamp-on type of current transformer that may be used to extend the range of the oscilloscope to very high current observations.

scope screen that is represented by the dotted rectangle. It will be noted that this is the case of the leading tube firing too early, and hence its firing point should be retarded. *Fig. 7* shows hows how the current would appear after proper adjustment of the control is made.

This timing adjustment should be made on all controls when initially installed. Failure to do so may result in unbalanced loads on power tubes and possible overloading of one tube, excessive line current demand, and poor welding conditions.

(*3*). As the phase control is advanced on phase-controlled welding machines, the current waves increase in size until a full, continuous sine wave is reached. This point corresponds to full heat and should occur at 100 per cent on the phase-control dial. Advancing the firing angle beyond this point will result in asymmetry of the current wave, as noted in Section (*2*). Consequently, the same test can be used and the phase-shift network in the control adjusted until full wave is reached at the 100 per cent heat setting.

Another test which is sometimes used to establish the full-wave setting is to manually oscillate a small mirror (about 2 in. by 3 in.) in front of the viewing screen in such a way that the reflection of the stationary beam describes a straight line perpendicular to the direction of deflection of the beam. Then when the current pulse appears, it can be observed in its true form. At the same time, the gaps between phase-controlled portions of the wave can be noted and also the position of the phase-control dial for which the waves merge into a continuous sinusoid. This point can then be made to coincide with the 100 per cent setting as previously explained.

The skill required for the observation is very slight and a little practice will reward the observer with a sensitive method of adjustment. It will be found that either translatory or rotary motion of the mirror will produce the required effect. Translatory motion is easier to control and most operators prefer it. It is unnecessary to move the mirror rapidly. Rapid motion merely elongates the apparent time axis. A little experimenting will guide the observer in this respect.

(*4*). The magnetic oscilloscope measures peak current directly. For full-sine-wave current, the rms value can readily be calculated by multiplying the peak value by 0.707, which is the ratio of rms to peak for a sine wave. Since this ratio does not hold for phase controlled waves, the instrument cannot be used to measure the rms value directly. For ordinary purposes, such as calculating the size of tubes required, or maximum line demand, it is the full-wave value of current that must be known.

The measurement of the rms value of phase controlled currents of short duration can be accomplished with this instrument as follows:

Place some scrap material in the welding machine and turn the spot length up to several cycles so that a good reading can be obtained with a pointer-stop ammeter. Read the pointer-stop ammeter and also the oscilloscope for different settings of the phase-control dial. Plot a curve of rms current *vs* deflection of the oscilloscope. This calibration will then hold good for this particular machine, and the oscilloscope can be used to measure extremely short phase-controlled pulses of current to the work.

(*5*). The voltage regulation of a supply circuit during the making of a weld can be observed by connecting the voltage terminals of the oscilloscope to the line and observing the voltage trace. When the weld is made, the crest voltage will be observed to dip. One hundred times the ratio of this dip in deflection to the total deflection is the percentage voltage regulation.

Another means of observing the regulation is to measure the line voltage ahead of the control (when the machine is not welding) and also the voltage at the welding transformer terminals (when welding) by means of the oscilloscope. This measurement will include the effect of tube arc drop as well as line regulation and will indicate the actual voltage at the welding transformer.

The voltage measurements made with the oscilloscope are obtained in terms of peak value and the same conversion factor applies as for current waves (multiply peak value by 0.707 to obtain rms). This factor applies to full sine waves only in the same manner as for current waves.

(*6*). Where nonsynchronous controls are used, it is sometimes desirable to know the magnitude of the transient currents resulting from the random phase angle of energization of the welding transformer. These transients can readily be observed by watching the current wave on the oscilloscope. This method has considerable advantage over the use of a pointer-stop meter in that each transient may be observed and may differ from the preceding ones. Several similar pulses are required to obtain a reliable reading with a pointer-stop meter.

(*7*). A pointer-stop ammeter is frequently used to measure rms demand currents of short duration. Such measurements are reliable only when the current wave is symmetric and when successive pulses are identical. Where important measurements are being made, they can be monitored by the oscilloscope to make sure the current meets the required conditions for accurate measurement. Otherwise the results of such measurement may be very misleading.

Conclusions

Experience has indicated that the magnetic oscilloscope is of great value in checking the operation of resistance-welding controls, in trouble shooting, and in making installation adjustments. It supplements, rather than supplants, other instruments used in this work. Its particular merits are:

(*a*). Practically complete freedom from interference by stray fields.

(*b*). High-speed response (about 1/3000 sec).

(Continued on page 42)

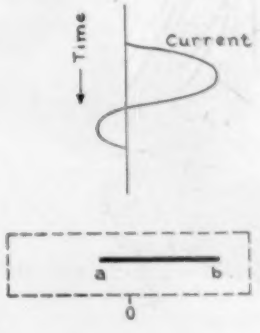


Fig. 6 — (Left) An asymmetrical one-cycle current wave *(above)* and its trace on the oscilloscope screen *(below)*.

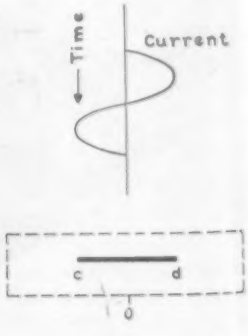


Fig. 7—(Right) A symmetrical one-cycle current wave *(above)* and its trace on the oscilloscope screen *(below)*.

The Pit River Bridge

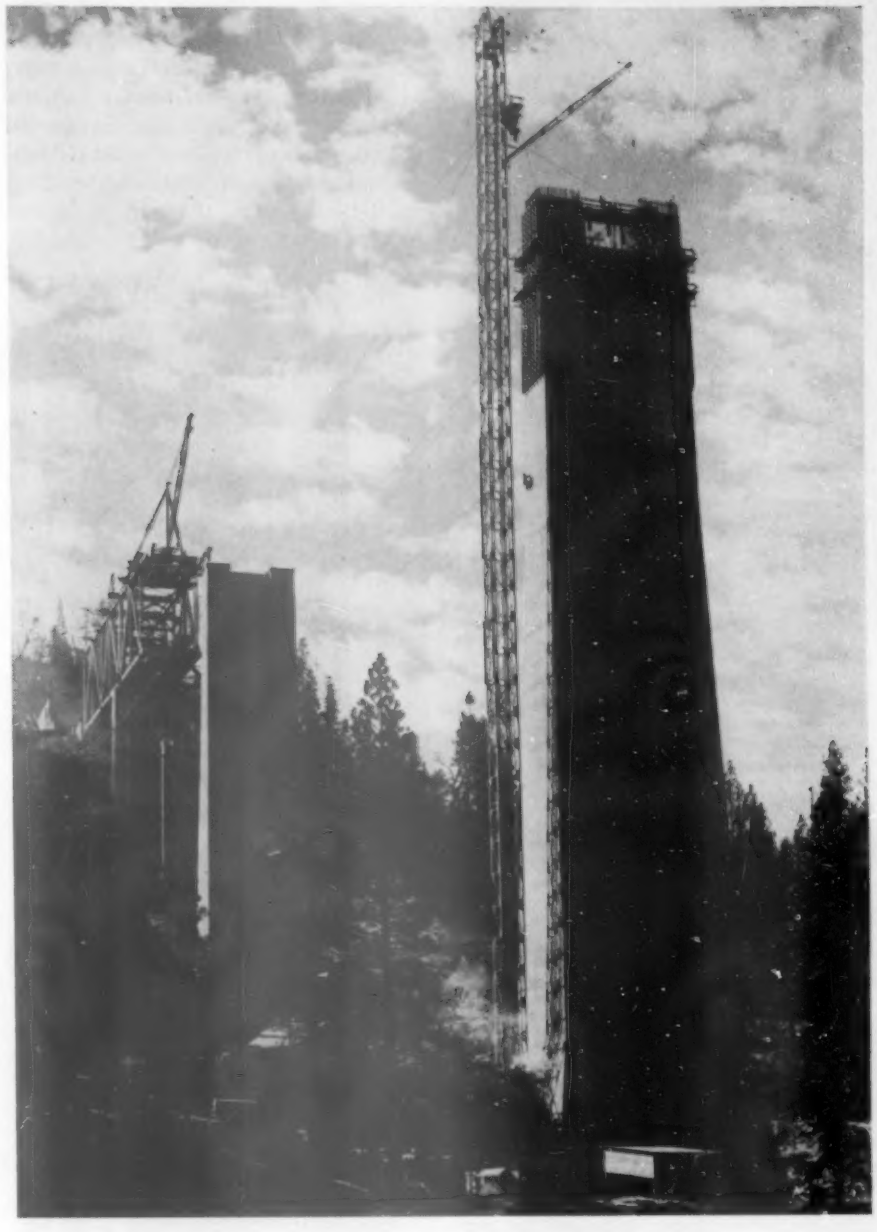


Fig. 1 — Shorter abutment piers completed and steel erection started. Falsework tower, as shown in the foreground with short boom handles reinforcing steel, forms and concrete of a nearly completed tall pier.

By

HENRY W. YOUNG

The building of the piers for the world's highest double deck bridge presented some unusual problems. The welding problems were partly solved by pre-heating and rigid testing of weldors.

THE closing link in the railroad and highway relocation work necessitated by the building of Shasta Dam, the Pit River Bridge, will have the distinction of being the highest double-deck bridge in the world. The top deck of this bridge will carry a four-lane highway while a double-track railroad spans the Pit River on the lower deck.

The length of the bridge is 3687 ft with the longest span 630 ft and ten piers are required to cross the deep river canyon. Piers Nos. 3 and 4 are the tallest concrete piers ever constructed, they are 357.5 ft and 362.5 ft respectively. When the dam is completed and the reservoir filled, all piers will be submerged to within about 100 feet of the top deck of the bridge.

It is only natural that these tall piers would have the heaviest reinforcing steel bars yet to be used in concrete work. These bars were two inches square furnished cut in 60-foot lengths. In the pier the bars were made continuous and placed so as to form a dense curtain of steel near the outside surfaces on all four sides of the piers. Around the sides of the cellular spaces there is another curtain of reinforcing rods one inch square. Thus a total of 10,930,000 lbs. of reinforcing steel, all specially rolled, was required for this job. The butt welding of the reinforcing bars to make them continuous requires a total of over 8000 welds.

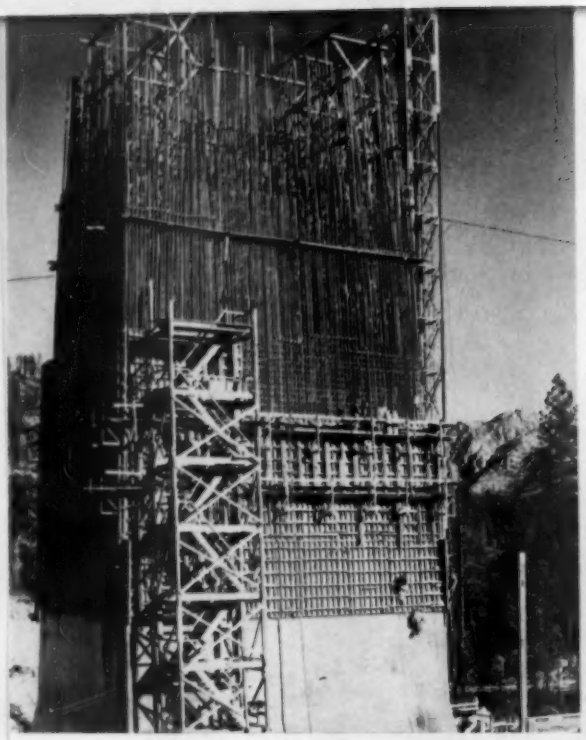


Fig. 2—One of the tallest piers (358 ft. when completed) is 90 by 95 ft. at the base. Note how the two-inch-square reinforcing bars are placed and how concreting follows closely upon erection and welding of the steel.

This bridge is being built for the United States Bureau of Reclamation, Central Valley Project, under contract. The Bureau specifications are rigid in all matters so naturally only fully qualified welders could be used on this welding work. Not only must all applicants first demonstrate that they can make a weld of the type that will pass the breakdown test of the Bureau, but each man must weld his two test joints with the bars mounted in a wooden cage (Fig. 3) simulating actual working conditions. This is made of 2 by 2's so spaced as to compare with the spacings of the reinforcing bars on the job. Working on the test bars by getting in between the 2 by 2's has proved to be a hurdle that a good many applicants could not make. After passing the test and getting to work, the quality of each man's welding is constantly checked. This is ascertained by cutting out one joint in about every hundred he makes and giving it a breakdown test.

Problems Involved

The welding involved in the placing of the reinforcing steel not only made the job unusual but also extremely difficult. In fact, the sub-contractor on the welding found the welding sufficiently difficult to warrant giving up the contract. By this action the Union Paving Co., Redding, Calif., contractors for the bridge sub-structure were forced to secure welding equipment and undertake the welding with its own crews.

The difficulties encountered in the welding of the reinforcing bars were traced primarily to two causes: The restricted space in which the welding must be done and the size of the reinforcing bars.

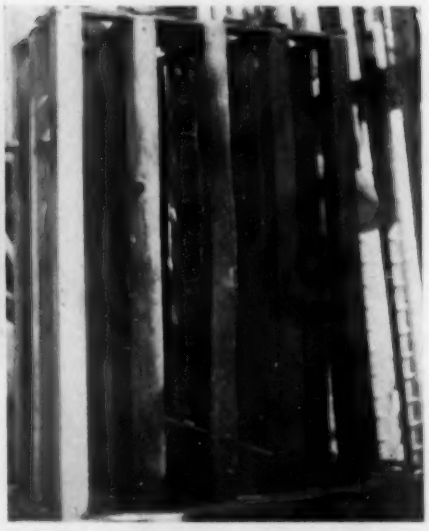


Fig. 3—In this wooden cage the prospective welder must weld his two test pieces.

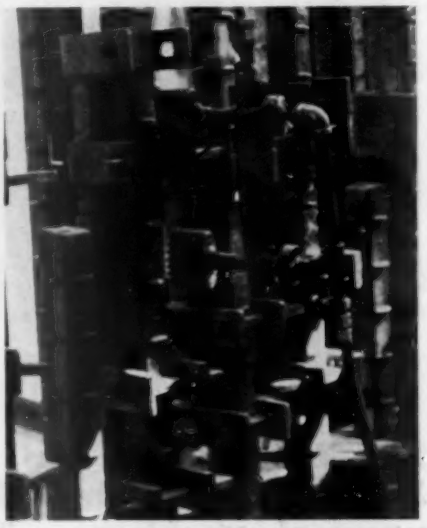


Fig. 4—The clamps to hold the reinforcing bars in alignment. Note two preheating burners each with a gang of six jets on the second bar.

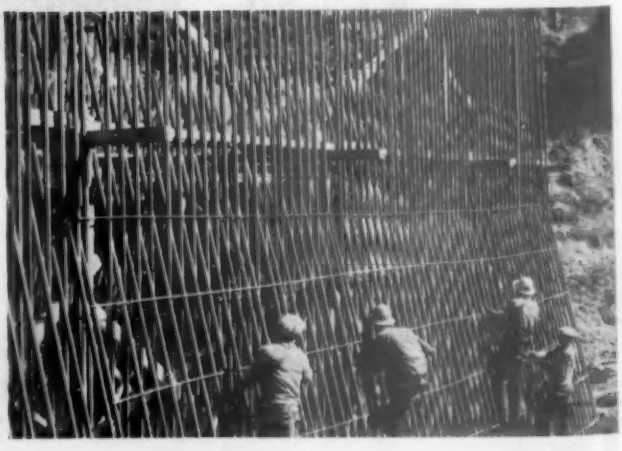


Fig. 5 — Overlapping of the bars of the two faces causes still greater restrictions on the space in which welders work.

The reinforcing bars are placed in four parallel rows and the spacing varies from 12 in. centers down to 6 in. centers. As shown in Fig. 5 they form a dense curtain of steel. Near the bottom of the piers the spaces are even more restricted, for there the batter changes from 4 in on 12 in in one direction and 2 in on 12 in in the other to ¾ in on twelve and ¼ in in twelve, respectively. At this point, the two sets of reinforcing bars are staggered and overlap vertically, making twice as many bars in a given amount of space.

A heavy supporting structure was required to hold the bars in place. This was made of timber coupled with rail falsework and so designed as to hold the bars in an end to end position for welding. With the upper end fastened to the falsework, the bars are supported so that the facing ends are separated by a distance of 3/16 in. The Soule Steel Co. of San Francisco under a sub-contract, cut, bend and place the steel in position ready for welding.

Weld Specifications

Specifications for the butt welding call for the following procedure. All bars are beveled to an angle of 45 deg. The lower end of each bar, which opposes the upper end of the bar below, is also beveled in the other direction at an angle of 30 deg as shown in the sketch (Fig. 6), bringing it to an edge. It is this edge that is held 3/16 inch above the other surface, forming a V, which is to be filled by the weld. To maintain the bars in alignment, special clamps are used as shown in Fig. 4 which also shows the equipment for pre-heating the ends. Two of the gang jets used in pre-heating may be seen in this picture.

The bars are pre-heated for a distance of nine inches on each side of

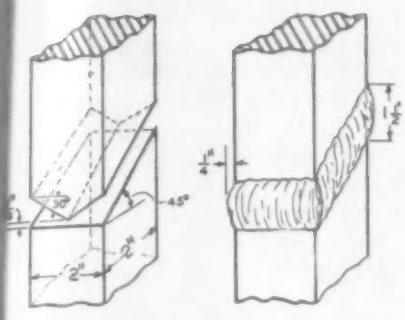


Fig. 6—Note the peculiar manner in which the bars were beveled. Also, note the size of the weld bead and reinforcement.

the joint to a temperature of 500 F. Butane gas was used for heatings principally, although during some very cold weather "Uno" gas was substituted as a fuel. After the steel has reached the proper temperature, the welder makes two passes at the apex of the angle on each side. This serves to join the knife edge of the upper bar to the plane surface below. He then proceeds to lay on metal, peening after every pass. When the "vee" is completely filled, the outer surface is built-up to reinforce the weld as is shown in the sketch (Fig. 4.)

Following completion of the welding comes pouring on the concrete, seven-ply plywood forms ¾ in thick are being used. Fig. 2 shows how closely this work follows the welding. The total amount of concrete in the bridge piers and their foundations will be 96,275 cu yds. Completion of the foundation blocks for the piers were hastened by installing a water cooling system of the type used in the construction of large concrete dams. Figs. 1, 2 and 5 courtesy U. S. Bureau of Reclamation.

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Concrete Cars for Shasta Dam

BUILDING Shasta Dam will be a big job but welding is simplifying some of the problems arising in connection with this huge concrete dam. It has been estimated that if work is continued on a twenty-four hour day basis it can be completed in three years.

To facilitate the transportation of concrete between the mixers and its final resting place, the Pacific Constructors, Inc., decided to use a railroad. This novel means of transportation necessitated the design of special equipment, so concrete cars were rebuilt of welded construction in the contractor's shops at the dam site.

The trucks on these cars were designed to turn on a 210 ft. radius by canting the wheels and decreasing the diameter of the inside wheels. This made it possible for the cars to travel on a circular track under the mixing plant and the cable ways of the main handling tower of the dam. The bolsters were rebuilt to give them greater strength than needed on ordinary cars. The rebuilding of the cars and the construction of the hoppers was done entirely by welding. Each car is electric motor powered and carries two 8-yard specially designed concrete hoppers (Fig. 1). Figure 2 is a bottom view of one of them with its ribs cut from one-inch plate. The hopper bottom acts as a door for the release of the concrete into the cable-way buckets, also of 8-yard capacity. A top view of one hopper is shown in Figure 3, taken before welding around the rim was completed. The individual in the picture is over six feet tall, and is only a "drop in the bucket."

Fig. 2—The ribs on the door were cut from one-inch plate.

Fig. 1—Each of these all-welded hoppers on this specially constructed concrete car has a capacity of 8 cu. yds.

Fig. 3—A view of the top of one of the hoppers.

All photos from Air Reduction Sales Co.

The Training of Welding Operators

By T. B. JEFFERSON

In this article, a paper which was presented at the Western Metal Congress, Los Angeles, the Editor of The Welding Engineer discusses the training of student weldors from the standpoint of both the student and the prospective employer.

THE Training of Welding Operators is a subject that can be discussed with many points of view. The welding industry's problem of supplying our defense contractors with trained competent weldors is equally as important as the problem of supplying these same defense contractors with welding equipment or efficient welded designs. In fact, welding equipment and designs will be of little value if a shortage of skilled weldors should develop in the near future.

This Society has long been aware of these training problems and the subject of Training Welding Operators has been discussed frequently at the Society's national meeting. Usually, however, these papers have been presented by educators or operators of welding schools, consequently the story has been presented from the educator's point of view.

Today I hope to cover the subject of the Training of Welding Operators from a slightly different angle—the employers angle. The opinions to be expressed are based upon my actual experiences, first, as an employer of several hundred weldors and more recently, as an observer of happenings in welding schools and the welding industry as the Editor of *The Welding Engineer*.

The importance of the weldor in the time of national defense has been established by the fact that for over a year England has excused weldors over 21 years of age from military service. In this country we find that in every industrial plant engaged in metal working for defense production there is to some extent the use of welding and cutting and employment of persons skilled in these crafts. The result has been that an intensive training program has been undertaken under government and private sponsorship to insure a further supply of skilled weldors.

Problems Involved

It is only natural in such a speeded up program, for many false starts to be made. Welding training courses have been started without serious thought as to requirement or consequences. It should be remembered that in every program for the Training of Welding Operators, whether it is in connection with the training plan of a welding school for training hundreds of weldors or an industrial plant training one weldor, the program is confronted with three problems. These three problems evolve themselves into the three principal points affecting the success of every training program. They are:

1. The student
2. The teacher
3. The equipment

So that our thoughts might follow a definite line, let's consider operator training firstly from the student angle.

Student Selection

As plant managers and executives you are looking for weldors. These weldors may be experienced men, thoroughly trained in welding; or maybe your company is inaugurating its own training program and will train welding students to suit the needs of the plant. In either case your ultimate weldor will have received training of some nature before being classified as a weldor. In the event you elect to train your welding personnel, what kind of a man are you going to select as a student?

I believe you will all agree that great care should be taken in the selection of the welding student. Too often an applicant is admitted to a welding course without any thought being given as to whether he is likely to become a satisfactory weldor. Part of this laxity may be contributed to the principles upon which some welding schools have been founded—the principles of operating a school for the money that is to be obtained from the students rather than for a fair profit while dispensing the knowledge the student is obtaining from the school. It is fortunate for both the student and the industry, that a majority of the country's welding schools are operated with their

first thoughts directed toward the student's welfare.

To avoid the risk of stepping on someone's toes, let's assume that we are interested primarily in a training plan for an industrial plant. In this event it is vital to the company's interests that due consideration be given the type of individual which is selected for weldor training so that only those candidates which are most likely to succeed will be selected. There are many reasons for this careful consideration, one is that to train a weldor, it costs the company between 25 to 30 cents per hour for material alone. To this cost must be added charges for instructors, equipment depreciation, as well as repair and maintenance. So it may be seen that even on a non-profit basis student training is costly.

Another reason—a more important reason, is that the entire efficiency of future weldors and the welding industry depends upon the intelligent selection of students. If the trainees selected are of low intellect and poor mechanical aptitude, a poor weldor is most likely to be the result. On the other hand, if these qualities are high, the high quality of workmanship and the initiative of subsequent higher type of weldor will result in greater progress in the welding industry.

Characteristics Sought

What qualities and characteristics in a student is most likely to make him a good weldor? The answer is somewhat the same as the answer to that age old question "How high is up?" The making of a weldor from a student depends upon many variables but by careful analysis the probabilities of the outcome may be gaged fairly accurately.

The first thing that should be determined about our student is: Do we have a trainee who is trainable? Just as there are those who will never learn to drive a car or play a piano, by the same token there are those who cannot learn to weld. If after a few hours of instruction your trainee proves to be the untrainable type, you will save time and money for both the trainee and the company if you tactfully suggest he learn some other trade. An investigation of the trainee's industrial experience, his attitude and his mechanical aptitude will give an insight as to his trainable potentialities.

If we feel we have a trainable trainee, what other characteristics should we look for in our student? A study of weldors indicates that there are probably three qualities which should be considered before training is begun or at least before it has advanced too far. These qualities are:

(a) Mechanical aptitude
(b) Physical characteristics
(c) Attitude

Mechanical Aptitude

Mechanical aptitude is believed to be the most important quality, aside from trainability to be sought in a trainee. A student must possess ability and mechanical inclination, without it he will probably find it difficult to become proficient. Practice coupled with skill, in this case mechanical aptitude, is the only way to obtain proficiency in welding just as practice and skill is the only way to become proficient as a machinist, a toe dancer or an artist. Without skill a trainee will never become proficient or happy in his work.

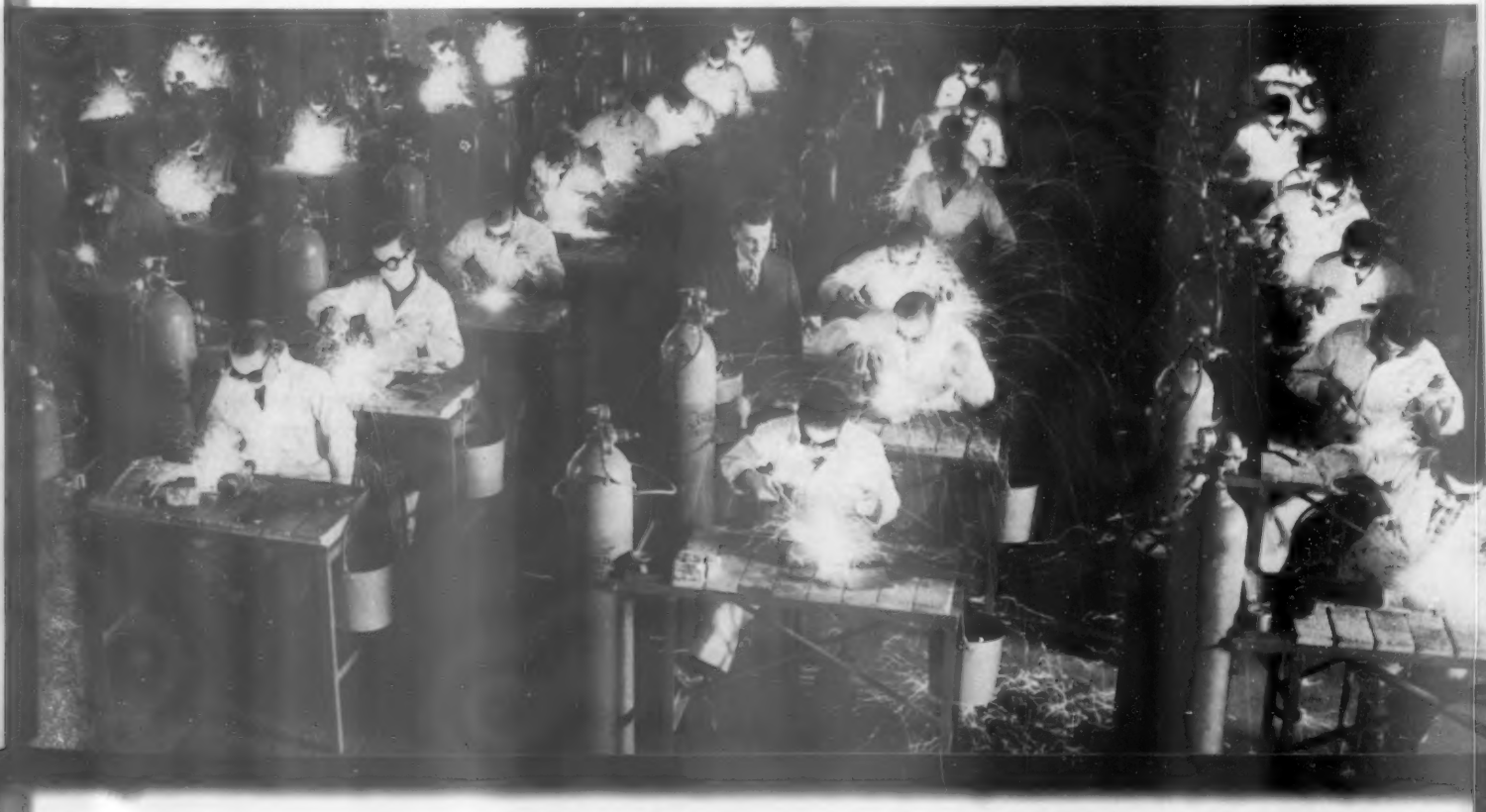
Physical Characteristics

What physical characteristics go to make the best weldors? Observation leads one to believe that there are some important physical factors which definitely affect the ability of a trainee.

First of all, to become a proficient weldor a trainee should possess normal coordination. His fingers must be able to follow quickly and easily the thoughts of his mind.

He must have normal mentality. This does not mean that he is to have a specific intelligence quotient rating or that he be given an IQ test. It does mean, however, that the trainee should have a normal mind which will absorb information. Likewise, his mind must have a normal capacity to learn. If he is capable of visualizing and has been trained to appreciate relative values of size and perspective, there will be little doubt as to his capabilities as a student.

The senses too are important! A trainee should have normal hearing and vision which is normal or which has been corrected to normal. If the vision of a trainee has been corrected with glasses it will be found that weak eyes are not a handicap. Experience has shown that welding is not harmful to the eyes, however, some weldors have injured their weakened eyes by straining them, trying to see through heavy welding



An ideal setup for the training of gas weldors. (Casey Jones School of Aeronautics Photo.)

lenses unaided by corrective lenses. If the trainee has poor eyesight, see that he wears glasses under his helmet or goggles, better work with less headaches for all concerned will be the result.

The physical build of trainees is something which some plants are beginning to consider. Only persons of average size or build are employed. This is not because average sized persons are capable of producing more work than other persons but because they produce less work stoppage. It has been found that when a person of unusual height, unusal weight or one having some other outstanding physical characteristic goes through the plant, fellow workers frequently stop and look. Naturally, this "stopping to look" on the part of the entire plant slows up production. Consequently the tendency is to avoid the unusual type in both trainees and employees.

Age is a problem which creeps upon all of us and is also a problem in a program for the training of welding operators. In some instances the ages of trainees that are to be trained as all around weldors have been limited to those prospects between 18-35 years old. The contention is that "you can't teach an old dog new tricks", for this reason prospective students over 40 are looked upon with disfavor. The feeling is that persons over 40 seeking to learn welding have perhaps experienced periods of unemployment in recent years. But, if they have been employed it is very likely that employment has been in a field that is vastly different than that of the welding industry. In either event it is felt that the applicant will possess only a fair initiative and probably would not become a proficient weldor.

It is hoped that these opinions on a trainee's physical characteristics will not result in any feeling that certain persons are being discriminated against in the welding field because of age or other features. These are merely factors we all must face in this day of modern business and streamlined production.

Attitude of Student

The third of our trainee qualities which should be ascertained is attitude. Attitude toward the company for which he is to work, toward his work and toward his fellow worker. Naturally company loyalty is to be sought from every employee for this reason this quality should be sought first in the prospective trainee. In this day and age we hear a lot about personality and though some may think it strange, your trainee must have personality for personality frequently affects attitude—not necessarily the personality of the super salesman but he must have social acceptance so that he can meet and greet the public. His temperament and spirit of cooperation must also be considered when determining the trainee's attitude. A weldor is frequently called upon to work in close cooperation with fellow workers so he should be one that will cooperate and one with which it is easy to get along.

So much for our trainee. While these specifications cannot be adhered to rigidly, it is believed that they will prevent some attempts "to place square pegs in round holes." As is often the case, considerable time is wasted in trying to place a trainee in some position only to find later that he is unsuited. If the aforementioned suggestions help reduce the frequency of these unsatisfactory happenings, they will have accomplished their purpose.

Gas cutting is an important phase of weldor training. (Photo National Youth Administration, Chicago.)

The Teacher

Our next concern is our teacher. As we all know we must have a successful teacher but what are the requirements of such a teacher? According to the Syracuse Bulletin a teacher to be successful must have:
The education of a college president,
The executive ability of a financier,
The humility of a deacon,
The adaptation of a chameleon,
The hope of an optimist,
The courage of a hero,
The wisdom of a serpent,
The gentleness of a dove,
The patience of Job,
The grace of God and
The persistence of the devil.

Now it is hardly believed that such requirements are necessary to teach welding in an industrial plant or commercial trade school. It is not even necessary that he be a skilled teacher but he must know how to teach. Training progress is often impaired by the teachers. Remember those old sayings—"those who can, do; those who can't, teach" and "those who teach for 5 years are no good for anything and then after teaching for 10 years are not even good for that." This does not mean, however, that teachers don't know their "stuff" or become antiquated with years of teaching; they are likely to though if they fail to keep up with the rapid changes in the industry. Teaching is a varied profession covering many fields. It should be remembered that supervising is teaching and that salesmanship is teaching, in either case ideas are being presented to enhance the knowledge of another.

How can we recognize a good teacher?

Qualities of a Teacher

A good foreman will make a good teacher. Foremen often hate to be tagged as teachers but every foreman at times has had to give instructions to a new employee or explain a new

job and as soon as he undertook these tasks he became a teacher.

A good welding teacher must be a master weldor—he must be a top-notch in his trade, one with plenty of experience and one who is qualified to seek out difficult answers and to conduct practical demonstrations.

A teacher must have the *ability to organize* for proper organization is the backbone of every training course. Students must be organized so that they will get the proper start into the course of instructions; instructional material must be organized so that it will be presented in an orderly fashion. The effectiveness of these organization jobs are dependent upon the instructor's ability to organize.

Another quality and probably the most important for a good teacher is the *quality to teach*—the ability of the teacher to transfer his thoughts to the student. A teacher that cannot pass his thoughts on to the pupil will find it very difficult to teach even the most apt of trainees.

We must remember that in the training of welding operators the teaching process is identical whether there is one or fifty trainees and irrespective of whether the training is to be carried out in the shop of an industrial plant or in a commercial trade school. In any such training program there are four steps to be followed:

1. Preparation of material
2. Presentation of material
3. Practice
4. Examination

Preparation of Material

The preparation of material presents some serious problems particularly in connection with our defense program.

To prepare a training program to meet the welding requirements of defense contractors it is necessary to investigate the welding application applicable to these industries various fabricating processes. Only when these points have been determined is it possible to correctly emphasize certain portions of the training program so that the trainee will be qualified for the fabricating job at hand.

After the principal points of the training plan have been settled, another problem appears. Should the trainee be trained on an all-at-once basis in which case all the fundamentals are taught at once, after having covered all the principals of welding he is to master these basic principles by repetitive review; on the other hand should he be trained step-by-step in which case each principle is mastered before undertaking another?

Adequate room for welding practice in a well kept school encourages the student. (Hobart Bros. Co. Photo.)

Our defense program has further complicated this phase of the welding training by questioning as to whether trainees should be given comprehensive training or single operation training. By comprehensive training the student is trained to become an all around weldor familiar with all metals and capable of welding in all positions. In single operation training a student is taught in a much shorter time and usually is qualified only to do one type of welding, e.g., downhand welding on steel plates.

Comprehensive Training

The problem of comprehensive or single operation training is one that will most likely be solved by those conducting the training program. Industrial plants will undoubtedly prefer the single operation type of training because by this teaching method a trained weldor is obtained after a shorter and less costly training period. Likewise single operation welding is ideally suited for production work. The disadvantage of single operation training is that instead of having developed a proficient weldor the training course gives industry a mechanized man trained to act in only one way. Such training does not lead to proficiency or tend to make a booster for the welding industry. Instead, it will likely lead the trainee to disappointment when our country settles back to a normal business pace and our single operation weldor learns that he is not a weldor qualified for big money but only a semi-skilled laborer who knows a little about welding.

Single Operation Training

To counteract this thought there will be presented the argument that if the trainee is given comprehensive training in all phases of welding that it will be very unlikely that he will be called upon to demonstrate his technique in all the welding processes in any one industrial plant. Consequently it is claimed that comprehensive training is a waste of time. It is further argued that in the short time devoted to a comprehensive training course that it would be impossible for the trainee to become proficient in all applications. Even though the trainee has sufficient training time, it is also unlikely he would become a weldor of such high quality as to be considered proficient in all applications of the welding processes.

The outstanding point in the favor of single operation training is the fact that it will give our defense industries the greatest number of trainees in the shortest period of time. By this system of training it is possible to supply

a prospective employer in a very short time a group of operators proficient in a specific application.

For such a training plan to be successful, however, it is absolutely necessary that the requirements of the employer be ascertained and that the training program be prepared to meet these requirements. In this system of training it is important too that the trainee be given employment as soon as the desired proficiency is attained, otherwise the trainee, who has not had sufficient training to have thoroughly embedded welding habits, might forget his training while awaiting employment.

Irrespective of the type of training it must be remembered that all men in a welding course will not proceed at the same pace. In the preparation of material the course should be planned so that the class can be kept as uniform in its progress as possible.

Presentation of Material

The manner in which the material in a training course is presented naturally is vital to the success of any such course. Presentation of material to be successful should follow four well defined steps:

(1) The Lecture—Oft times the lecture may prove to be the most difficult part of a training course from both the standpoint of teacher and trainee. It must be a *planned* classroom lecture; the instructor must have a planned, organized presentation. Some feel that this lecture need not be given by the same instructor who gives the shop work out. I believe as a rule more satisfactory results will be obtained if the same person handles both the lectures and exercises.

(2) Outside study—In most training programs it is found beneficial if the trainee is required to do outside study in connection with every lecture. This is true in welding training too, in which case outside study is on subjects which either review or supplement the lectures.

(3) Demonstration—It is during the demonstration period that the instructor comments on important points which were referred in the lecture. These comments are then supplemented by advice which can best be given only by demonstration.

(4) Practice of exercises — In these periods the student should practice various exercises to learn to apply the knowledge given him in the three preceding steps of the lesson and to acquire manual dexterity.

Practice

Practice or the application of those principles the student learns play an important part in the final success of the training program. It is here that the trainee by trial and error or more truthfully by trial and success builds confidence in his ability to become a proficient weldor. Each successful accomplishment builds more self-confidence and results in a further desire to do better work and to learn more about what he is doing. It is during this phase of the training program that the habits of the trainee will be acquired. In view of this the instructors should take care to see that the correct habits are acquired from the beginning. We must remember that habit is merely an established practice and for this reason the lesson must be learned the right way the first time and repeated in the right way until the habit is thoroughly established. After habits have been established, the trainee should then be placed on his own and be allowed to think out his own problems.

Examination

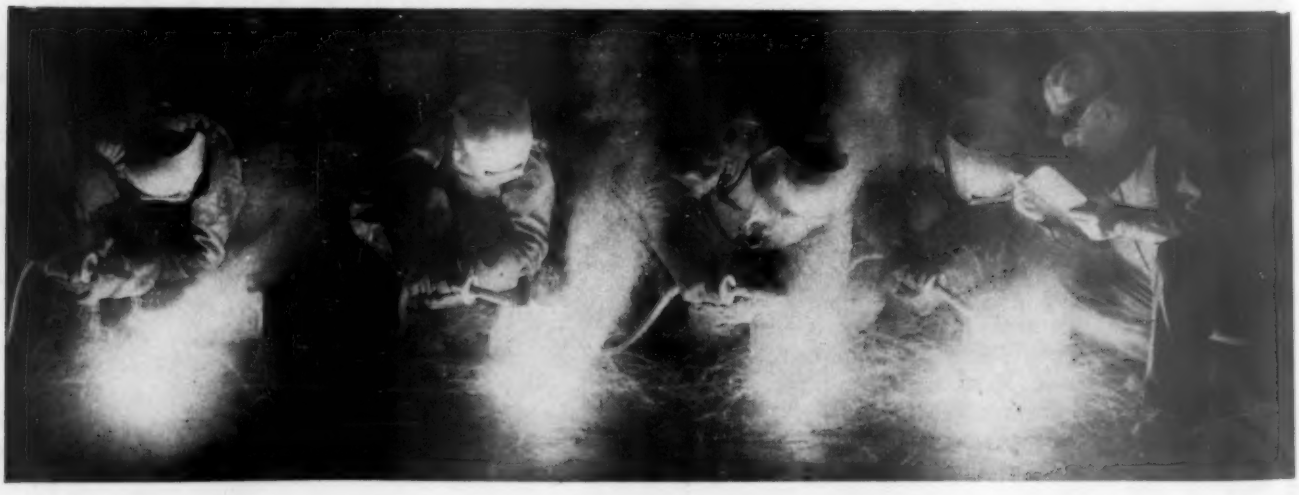
The final stage of a training program is the examination phase in which the instructor may determine by testing the results which have been obtained from his teachings. In this phase of the training the teacher must have a good understanding of human nature. He must know when to pat the trainee on the back, when to criticize and when to let the student plan his work. This is where psychology becomes a part of teaching.

School Equipment

In conclusion I would like to discuss briefly the equipment of a school for training welding operators. I shall not attempt to advise anyone regarding the amount of equipment required for a welding school or the amount of floor space that should be available for each trainee in the class. Likewise, the many other factors connected with the physical and business organization of a welding school are considered beyond the scope of this paper.

I would like to point out, however, that: The best equipment you can buy is none too good for your welding school. Be sure to get equipment that you can be proud of for it not only builds up the morale of the school but also of the students and the management. Lastly, it should be remembered that student training subjects equipment to more severe service than actual shop work.

THE END



Many industrial plants are training their own welding personnel. (Photo American Bridge Co.)

Fig. 1 — General view of arc welded aluminizing cell showing end cover.

All-Welded Telescope Aluminizing Cell

By

THOMAS C. WRIGHT
Designer
The Warner & Swasey Co.
Cleveland

The construction of a vacuum cell for aluminizing telescope mirrors presents many problems. Prudent use of arc welding, however, has made possible a more satisfactory means of fabrication despite the many limitations imposed. These limitations are explained and construction data is given.

To most of us, an astronomical telescope is rather a mysterious, if not a highly complicated scientific instrument. It is not at all surprising then that the manufacture of a telescope should require specially designed equipment and machinery. The equipment used in aluminizing the reflecting surfaces of telescope mirrors — the aluminizing cell is just such an item.

An aluminizing cell (Figure 1) is essentially a large vacuum cell which in this instance will receive mirrors up to 94 in. in dia. The function of aluminizing is to deposit a film of uniform thickness and capacity of aluminum or other metals, approximately .00001 in. thick on the reflecting surface of telescope mirrors. This can be done only under a vacuum of 10^{-4} m/m. of mercury or less.

The requirements of a cell for this type of high vacuum work are as follows: (1) The inside surfaces must be clean and smooth design; (2) all interior projections must be held to a minimum to reduce surface area; (3) the cell must be as light as possible for handling in transit, yet rigid enough to support a weighty mirror and have a low stress factor sufficient to resist collapsing while under a high vacuum load; (4) provision must be made to hang the mirror easily inside the cell for aluminizing; (5) the cell must be positively leakproof to maintain and hold an absolute pressure from .1 to .2 microns or less, during the outgassing process while aluminizing. This extremely low pressure is equivalent to .0001 to .0002 millimeters of mercury, referred to a 30 inch Barometer.

Naturally a cell of welded construction would be the easiest means for meeting these requirements.

The details of the construction of such cell follows: A specially selected boiler plate, free from surface dents and deep scratches was employed in the fabrication of the aluminizing cell proper, and standard rolled sections were used throughout for reinforcements. After fabrication, the inside surfaces of the cell and the end cover including all welds were ground smooth, as shown in Fig. 3, so that all scale, rough spots, pin holes and scratches were entirely removed. The purpose of this being two-fold, firstly, to reduce the porosity factor to a minimum, and secondly, so that moisture particles would have less tendency to cling to the inside surfaces and corners. Both of these factors would be detriments in trying to obtain a high vacuum.

Girth rings made from "H" beams were jump welded around

the outside of the cell to provide additional strength against collapsing while the cell is under a high vacuum load. This also affords protection against denting in transit. Pronounced irregularities from the true circular form may cause the cell to "cave-in" locally, due to external pressure, as the cell becomes an unstable vessel when evacuated.

The end plates on both cell and cover were heavily reinforced, (Fig. 1) with a double system of "I" beams and channels to withstand an equally distributed end load of 70 tons, due to atmospheric pressure. The cell proper is welded to a structural steel base. The "I" beams around the outside of the base provide outward flanges for the use of crowbars for leveling purposes. The base is provided with necessary platforms for the pumping equipment. On the left hand side of the cell there is mounted a mechanical vacuum pump with its driving motor. The pump is coupled in series with the tandem oil diffusion pumps on the right hand side of the cell.

Fabrication of Cell

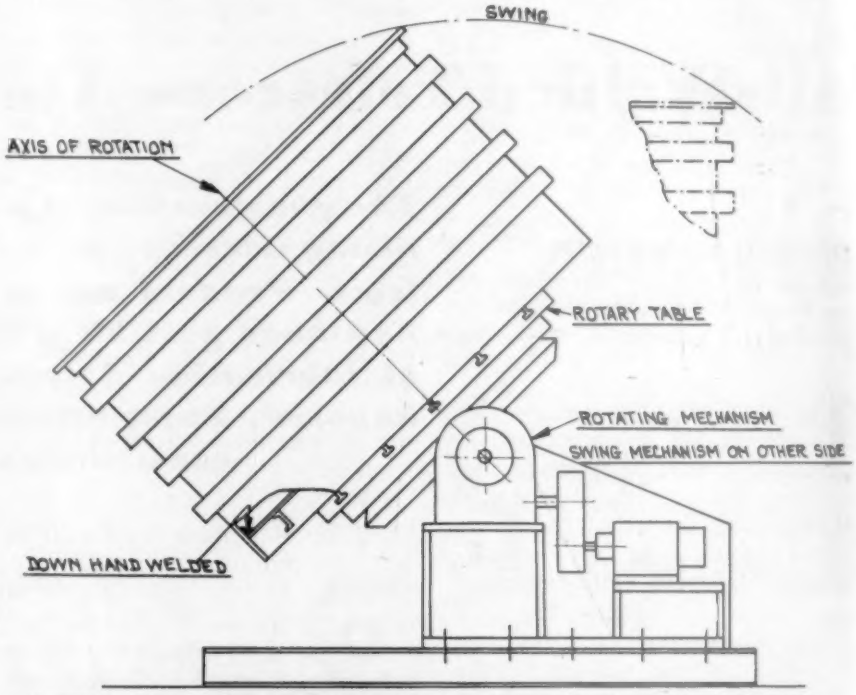
In the fabrication of the cell and cover, the units were securely held in a large universal welding fixture, as shown in Fig. 2, capable of being swung and rotated to every conceivable position so that all welding could be done downhanded to insure good fusion flow and penetration. The cell, upon completion, was tested as follows:

The cell and cover were bolted together sealing the tongue and groove joint with a special rubber compression gasket. Three holes were drilled in the cover plate for testing instruments. An air pressure reducing valve and gauge was fitted in one hole, a stop cock in another, while the third hole was provided with an additional air gauge as a double check on the reducing valve gauge.

Final Tests for Leaks

The assembled unit was then placed end up on blocks about three ft. above the floor. This was done to facilitate inspection for air leaks as well as to provide clearance for taking deflection readings on the end beams while the cell was under a 15 p.s.i. air pressure. A mixture of soap suds and glycerine was brushed over the welded seams and joint so that any air leak would be readily detected by bubbles. The result of this test proved that all welds were perfectly leak-proof. This was double checked by the fact that the air pressure gauge indicated no drop over a 24-hour period. The deflection test of the main end beams taken with a dial indicator gauge supported from the floor showed a reading of .085 in. to prove that the beam deflection was well within the allowable limits.

All-welded construction is well adapted to a product of this nature, it meets all the requirements and is much cheaper to build. Compared with two other possible methods of construction, welded steel in one case was 40% lower in cost while it was 15% lower than the other; in weight saving it was 66% and 12% less respectively.



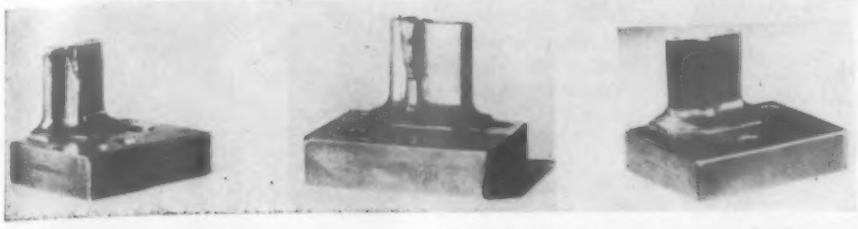
ALUMINUM CELL OF UNIVERSAL WELDING FIXTURE WHICH PERMITS DOWN HAND WELDING

Fig. 2—Units of aluminizing cell and cover were placed in universal fixture to place all welding in downhand position.

Fig. 3—Cell and end cover from which all scale, rough spots, pin holes and scratches were removed and on which all welds have been ground smooth.

* Data and illustrations from a study submitted to the James F. Lincoln Arc Welding Foundation in a recent award program. In its current $200,000 Industrial Progress Award Program, which closes June 1, 1942, the Foundation is offering 458 awards from $100 to $13,700, for reports of advances and improvements made by application of arc welding in design, manufacture, fabrication, construction and maintenance.

Brief Sketches of Welding Jobs

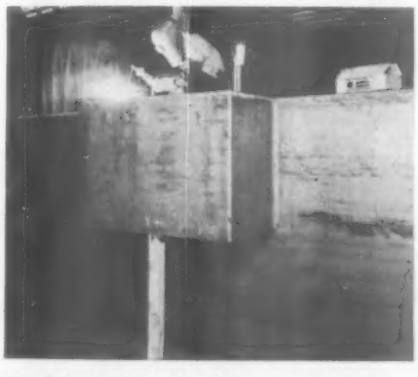


Welding for die repairs saves both time and money. (General Electric Photo.)

Die Repair by Welding

More than $6,000 a year and valuable time are being saved at the Bridgeport Plant of the Underwood-Elliott-Fisher Co. through the use of atomic-hydrogen welding. An atomic hydrogen unit has been in use for some time in the tool room of this office appliance plant to repair broken dies and tools—parts which otherwise would have to be discarded at a loss of both money and the time required to get new parts.

Shown in the above photographs is a typical die repaired at this plant, showing the broken die, which normally would have to be discarded; the same die after it had been built up through the welding process; and the die finished and ready for use.



Welded design eliminates castings on these stainless steel tanks (G-E Photo.)

Specialized Washing Equipment

Savings as great as 75 per cent in production costs plus a 50 per cent sales increase have been made by the G. S. Blakeslee Co., Cicero, Ill., as a result of the recent application of arc welding in the fabrication of its products. This company manufactures metal-washing machinery, degreasing equipment, and similar products. These are now fabricated completely by arc welding, except for certain spots where bolts are used to make sections removable.

Previous to the adoption of arc welding by the Blakeslee Co., various methods of construction were tried, but none proved satisfactory. Not only was it found very difficult to obtain the necessary water tightness with any means other than arc welding, but other forms of construction also meant greater maintenance and production costs, and slower procedure in manufacturing.

With the application of welding the Blakeslee Co. found substantial savings possible. A great number of castings were eliminated, set-ups were easier, machines could be produced from a sketch, and special machines could be built without a great deal of pretooling. The new washing and degreasing units are leak-proof jobs of stainless steel. The quality of the welded product has been greatly improved, as the welded seams result in smooth surfaces on the inside of the washing machines, preventing parts from being caught while in use, and the resulting smooth surfaces on the outside give a more pleasing appearance.

» «

All Welded Diecasting Machine

All-welded diecasting machines sufficiently strong and rigid to make sound castings with little "flash" on high speed production schedules are now in successful production at the G. & N. Manufacturing Company, Cleveland, Ohio. These machines, designed for casting of zinc, tin, lead, aluminum, brass and magnesium alloys, employ massive steel welded construction in the base, cylinder mounting, cylinder head, furnace, hydraulic fluid tank, shock cylinder, and goose-nech support. Only a few bolts and stud fastenings are used throughout the machine. Die plates of 6-inch thickness and 4-inch tie bars running through them preclude the possibility of breakage and assure a rigid machine.

The G. & N. diecasting machine employed with three hydraulic core pullers which work cores in three different directions. These automatic core pullers permit extremely fast operation of the machine. When making small simple castings without cores or complex parts and using automatic ejection, the machine may be operated at a speed of 600 cycles per hour. Due to the extremely strong construction of this machine, it has been found to operate satisfactorily at rates 20 to 30 percent faster than those usually practiced.

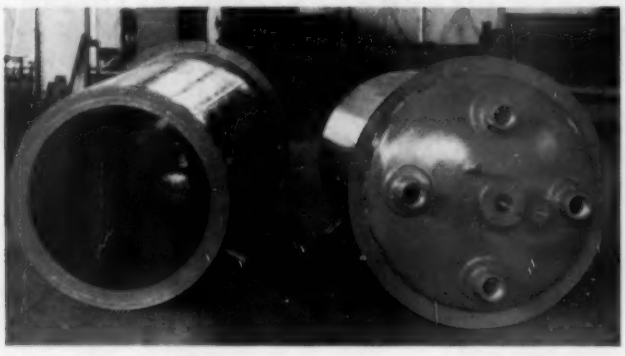
The welding machine is seven floors below. (Photo Harnischfeger Corp.)

Long Distance Welding

Because of its timely importance, the defense front has been the object of the current welding limelight almost exclusively. This lack of attention has had no effect, however, in slowing the progress of welding on the building front. The same speedy welding methods that are applied to today's submarines and freighters are being used more and more widely on skyscrapers and factories. This photograph bears out the fact.

It shows sheet metal panels being welded in place on the Milwaukee Post Office addition. Welding on the seventh story roof of this building required 180 feet of cable to permit "long distance" welding.

Increased efficiency is obtained from a machine of welded construction. (Hobart Bros. Co. Photo.)



Jacketed Melting Kettles Fabricated to U-69 Requirements. (Photo Air Reduction Sales Co.)

A.S.M.E. Code Welding

The compound melting kettles illustrated were recently constructed by National Annealing Box Co., Washington, Pa. They are 6 feet long, and each kettle is composed of two shells. The inside shell is 36 inches inside diameter, of ⅝-inch plate, with a head of ¾-inch plate. The outer shell is ½-inch plate, with a head of ⅝-inch plate. Space between the shells is 2½ inches.

Fabrication and welding were in accordance with Paragraph U-69 of the A.S.M.E. Code for Unfired Pressure vessels, which calls for qualification of the welding process used and of all operators employed on the job. The welding process qualification requires the development of 95% of the tensile strength of the plate in double welded butt joints, and 85% for single welded butt joints, with 20% free-bend ductility.

In these kettles J-groove welds were used throughout. Each kettle is subjected to a hydrostatic test pressure of 300 lbs. psi. The working pressure is 125 lbs. The four short lengths of pipe with welded flanges, visible in the kettle at the right are not inlet or outlet connections, but serve as supports for the kettle.

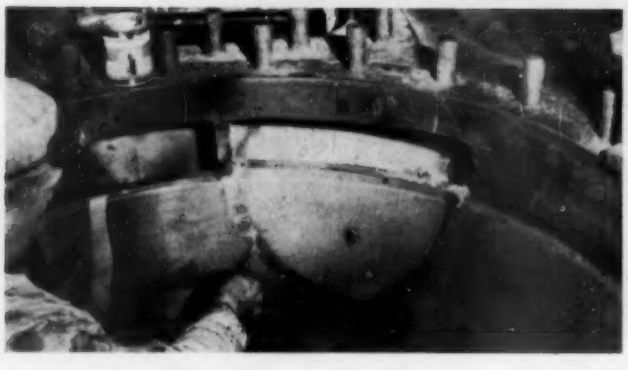
Sabotaged Ships Repaired

In spite of the severe damage to the main engines and other vital control parts of the German and Italian cargo vessels which the United States Government took over last April, repair work is being speeded to the point where a number of these ships will again be in service by the middle of the summer. The accompanying illustrations taken on the Italian freighters "San Giuseppe" and "Vittorin," show how brazing has made possible the repair of the main engines without the necessity for removing these engines from the ships.

On each ship, U-shaped sections had been broken out of the walls of the intermediate pressure cylinders just below the steam ports. After new sections were cast to fit the contour of the breaks, they were brazed in place as shown. Starting at the bottom of the "U", the operator alternated from one side to the other every 3 in., first half-filling the vee, peening the deposited metal, then completing the weld and peening. This procedure minimized contraction stresses on cooling.

Other parts on these ships which were repaired by brazing include main engine valves, cylinder heads, fire pumps, feed pumps, foundation columns, and steering engines. Both the "San Giuseppe" and the "Vittorin" are under the protective custody of the Treasury Department, with repair work being supervised by the Maintenance and Repair Division of the U. S. Maritime Commission.

As in World War I the oxy-acetylene torch is busy repairing sabotaged ships.



When the weldor gets through the engines are as good as new. (Linde Air Products Co. Photos.)

A cylinder head fabricated from steel plates by arc welding. (Photo Hobart Bros. Co.)

Cylinder Head "Aches"

Cast iron cylinder heads for huge 1500 H. P. gasoline engines used by the Ohio Fuel Gas Co. were a constant cause of trouble until a changeover was made to arc welded steel heads.

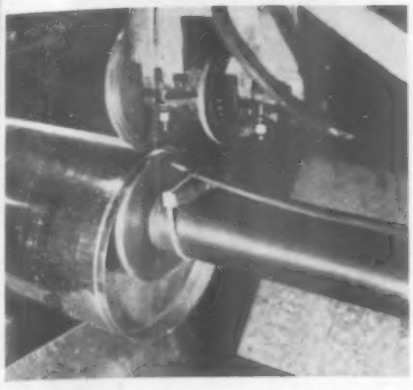
When these 24" cylinder heads became hot, they cracked. The cast iron cylinder heads were repaired by arc welding but after several breaks on the same heads it became necessary to junk them. Cost of these cast iron cylinder heads to the fuel company was $250.

Company engineers decided to replace the cast iron cylinder heads with heads of arc welded steel construction. This changeover was made eight years ago. Today, not a single cylinder head constructed from arc welded steel has cracked or required repairs. Total costs for the arc welded cylinder head are $206.50—a savings in original costs of $43.50 plus the savings of hundreds of dollars from the alleviation of breakdowns and maintenance problems.

Mr. F. A. Jones, general foreman of the Ohio Fuel Gas Co., itemizes the cost of the arc welded steel cylinder heads as follows: Steel parts—$105.57; Power, electrodes, helper, welder and overhead —$39.43; machining costs—$61.50.

Make a note now to attend the Metal Show at Philadelphia Oct. 20-24.

New Product Developments



Brazing with a seam welder.

Brazing Process

★ The **Thomson-Gibb Electric Welding Co.**, Lynn, Mass., announce a new process for the hard soldering of cold working copper, copper alloys and similar metals without loss of hardness or need for re-working, known as the **Briggs process of Tempobrazing,** U. S. Patent No. 2,223,312. It is claimed that Tempobrazing will be particularly advantageous in the fabrication of sheet metal products such as tanks, cans, boxes, boilers, continuous lengths of tubing, refrigerator parts and similar units where it is advantageous to cold work materials without the necessity of re-working after brazing operations.

The Tempobrazing operation is performed in a resistance seam welder with suitable means for inserting a silver brazing alloy between the pieces being brazed and for chilling the work immediately after the joint is made. By employing accurately metered electrical energy and special solder, having a flow temperature low enough to make excessive heating unnecessary, Tempobrazing makes possible accurate dual control of both it and the time of heat application.

» «

New Midget Welder

★ For use in welding light gauge metal, castings and drive shafts, general maintenance, and light production work, a new Flexarc welder is announced by **Westinghouse Electric and Manufacturing Co.**

Small for light production work.

Known as the **Midget Marvel WT-1,** this a-c welder comes complete with all accessories, even to the primary cable for hooking up the power line. Included in the accessories are electrode lead and holder, work lead, helmet, and a supply of electrodes.

Sensitive adjustment of the welding current over a range from 20 to 140 amperes is provided by 15 steps with correctly proportioned increments between steps. Full load rating is 110 amperes, 30 minutes, 30 load volts, when used on 220 volt, 60 cycle lines. The cost of power consumption averages about 5 cents an hour depending on local power rate.

The unit is very compact. Approximate dimensions are 14½ by 12⅛ by 20 inches long. Weighing only 160 lbs., the welder is supported on castors to facilitate mobility.

A valve for liquefied petroleum products.

New Combination Valves

★ The new **RegO 2580** and **2581 LP Gas Valves,** manufactured by The **Bastian-Blessing Co.,** 242 East Ontario Street, Chicago, Ill., are designed especially for use with permanently installed ICC cylinders and ASME or API-ASME above-ground containers. They are suitable for use with either flash or batch vaporization.

This series of RegO valves is said to embody in one simple assembly all of the following safety and utility features: shut-off valve for outlet connection; excess flow check valve for outlet connection; automatic quick filler valve and back pressure check valve; supplementary back pressure check valve; safety relief valve; fuse plug; fixed liquid level gauge and vent valve; variable positioning container inlet connection; and liquid eduction outlet tube. Only one connection is required in the container.

The RegO 2581 Valves are also equipped with elbow outlet adapters and loose rain caps on the safety relief valve and at the fuse plug discharge.

» «

Circuit Interrupter

★ High interrupting capacity and reduced mounting space are featured in the new non-automatic enclosed "De-ion" circuit interrupter announced by Westinghouse Electric and Manufacturing Co.

Known as the **NEMA Type 1A,** this sheet steel dust resisting circuit interrupter is designed to replace non-automatic disconnecting devices used in industrial plants and locations where enclosed unfused safety switches might be applied.

These two or three pole interrupters have 50 to 600 amperes ratings on 250 to 600 volts a-c and 125/250 volts d-c lines. Rust and corrosion resisting metals are used in all units, and all main contacts are of non-welding silver or special silver composition. De-ion arc quenchers are used to reduce contact burning and preserve the contacts.

Safety features include a cover interlock which prevents closing of contacts when cover is open, and opening of cover when interrupter is in the "ON" position.

» «

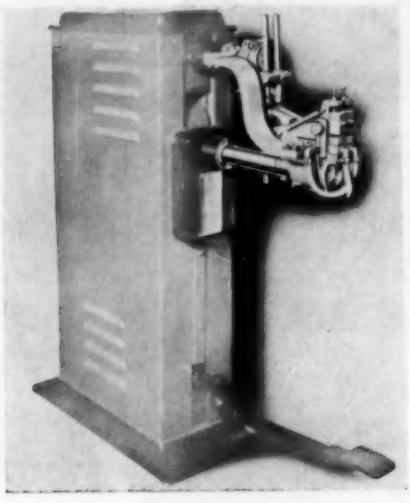
Tool Stand

★ A Stand into which the Senior Model Multi-Purpose Tool may be clamped is announced by **H & H Research Co.,** 12540-12th St., Detroit.

It is an ingenious accessory which greatly broadens the use of this Tool with reciprocating action. Clamped into position in the Stand it provides a unique filing machine for most types of work. It may be used generally in cases where the work is lighter than the Tool by bringing the work to the Tool, instead of taking the Tool to the work, thus eliminating the necessity of clamping each piece into stationary position on burring and filing operations.

The Multi-Purpose Tool is said to be designed for continuous operation on production work and can be used to eliminate slow, tedious and costly hand operations.

This stand places the work in position.



Butt welding is simplified.

Welder Conversion Unit

★ **Dyer Welder and Engineering Co.,** Kansas City, Mo., announce a new butt-welding attachment known as the **Rex Butt Welding Attachment.** This unit is said to be suitable for converting any rocker arm or walking beam type spot welder into a butt welder by simply removing the horns and inserting in their place the upper and lower sections of this new unit. No cables or rods to the foot pedals are needed as the entire operating action is said to be made wholly automatic by the movement of the upper arm.

The manufacturer states that the single operation of stepping on the foot pedal clamps both jaws simultaneously, pushes the movable die toward the stationary side, applies the welding current, completes the weld and upset and pulls the slide back to start position. The abutting surfaces are rapidly forged together and a uniform weld is obtained, free from porosity and approximately equal to the strength of the parent metal.

The Rex butt welding attachment is said to be a sturdy and capable accessory capable of meeting rigorous production schedules.

» «

Circuit Breaker

★ For use on any normal-duty application that would otherwise require fuses or fused switches, a new low-cost multi-breaker is announced by **Westinghouse Electric and Manufacturing Co.**

Available in two types, **M-1 and M-2,** these 15 to 100 ampere, 2 or 3 pole breakers are for use on a-c circuits up to 230 volts. The sheet steel enclosure is dust-resisting (Nema type 1-A) with 10 concentric knock-outs for conduit or cable connections.

In operating, a bimetal thermal element is actuated by overload or short circuit and causes the breaker to trip. However, while the breaker trips immediately on short circuit or dangerous overload, an inverse-time characteristic allows it to remain closed during temporary harmless overloads. An indicating target on the enclosure cover shows when multi-breaker has tripped.

» «

A-C Welders

★ The Miller Electric Mfg. Co., of Appleton, Wis., announce the introduction of a new line of transformer type **A-C Welders** with built-in power factor corrections. Designed in four different sizes, 300, 400, 500 and 600 amp., these new models are suitable for production work on manual or automatic welding.

It is claimed that this new unit answers a two-fold purpose for when it is not in use as an arc welder, it can be used to correct the power factor of present installations which will also result in less heating of the present power current.

Built to conform to N.E.M.A. standards, these welders employ Class B insulation, i. e., asbestos and fiberglas, and feature two open circuit voltages—80 and 100. Thus the operator is enabled to choose the correct voltage for the work at hand, which affords both maximum arc flexibility and lowest power costs.

Power factor correction is outstanding claim.

The amperages, shown by the indicator on the front of the cabinet, may be adjusted without breaking the arc simply by turning the ball crank handle which gives an infinite number of heat stages, making the units extremely simple to operate.

» «

Lubricant

★ The **Wayne Chemical Co.,** 9800 Copeland Ave., Detroit, announces a new powdered lubricant known as **Dri-Lube.** It is a silvery powder which is stated to be an extremely fine lubricant which may be used alone or mixed with oils or compounds.

It is the manufacturers' claim that it can be thought of as "white graphite" in that it can replace graphite in many uses without the smut or dirt of graphite.

Silver Soldering made easy.

Electric Brazing Unit

★ A new **Electric Brazer** for brazing and soldering with silver solder is announced by the **Ideal Commutator Dresser Co., 1935** Park Avenue, Sycamore, Ill.

This Brazer operates on the same principle as the popular Ideal "Thermo-Grip" soft soldering tools. It consists of a power unit or transformer and a pair of electric heating pliers. Holding the part to be brazed in the pliers, closes the secondary circuit causing the part to quickly heat to brazing temperature. Heat is accurately controlled by On-Off foot switch.

The Brazer operates on 230 volt, 50-60 cycle power supply. 440 volt and 25 cycle units are also available. Rating is 7½ KVA. Secondary voltage is reduced to only 10 volts. Heating pliers have 6¼" long throat. Face of carbon is 1¾" x 2" but may be filled to shape best suited for a particular job.

» «

Electronic Contactor

★ A new electronic welding contactor is announced by **Westinghouse Electric and Manufacturing Co.** Known as the **SW 150 Weld-O-Trol,** this unit, for spot welding applications, is rated equivalent to a size 2-W mechanical contactor at 220 or 440 volts, 50/60 cycles. It is claimed that welding current is handled at extremely high rate of interruption by two heavy duty water cooled ignitron tubes. The tubes are held by water cooled clamps made of copper tubing cast in heat conducting alloy. Provisions are made for removal of tubes without disturbing the water connections. A thermostat mounted on the cooling clamps protects the tubes against high temperatures caused by failure in the water supply.

The auxiliary control is mounted inside the Weld-O-Trol steel cabinet door to permit accessibility and yet allow physical separation from the power circuit. Ample space is provided for power and control leads. The unit is said to be readily adapted for use with heat control and either synchronous or non-synchronous weld timers including sequencing equipment.

"To be sure of the Weld be sure of the Governor"

Steel goes up on schedule with

PIERCE GOVERNED WELDERS

● With Pierce Governors welding current recovers its characteristics fully within .3 of a second after striking arc.

That means faster work on tough jobs—faster work on *any job*. It also means clean welding on every job. Pierce Centrifugal (flyball) Governors are precision-built for precision service . . . they give you split-second sensitivity with unfailing dependablity. That's why Hobart, Electric Arc, Harnischfeger, Lincoln, Wilson and other engine-driven welders are Pierce governed. To be sure of the weld, be sure the governor is a Pierce.

THE PIERCE GOVERNOR COMPANY
1607 OHIO AVENUE • ANDERSON, INDIANA

● If you are building your own welding outfit write us for helpful information on current regulation.

Pierce Governors

STANDARD SINCE 1913

New Product Developments

Galvanizing Compound

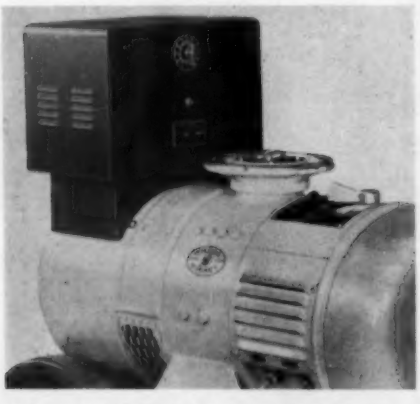
★ **Galen F. Biery,** 6246 - 28th Ave., N. E., Seattle, Wash., is now manufacturing a galvanizing powder known as **"Galvalloy".** It is the claim of the manufacturer that Galvalloy has the quality of fluxing itself to almost all metals and that it forms a protective coating almost equal to galvanizing and is the same color.

It is stated to be suitable for "regalvanizing" weld seams on galvanized items. It is applied by brushing it over a heated metal surface. Galvalloy is also said to tin aluminum so that it can be soldered.

» «

Crater Eliminator

★ The two outstanding characteristics of the deposited metal in the crater area are porosity and a distinct depression in the contour of the deposit. **Wilson Welder & Metals Co.,** 60 East 42nd Street, New York City, announces the **"Stroco" Electric Arc Crater Eliminator** for use in eliminating craters where the presence of the typical crater at the end of a weld deposit is objectionable.



Crater elimination is essential in many kinds of welding.

The "Stroco" Crater Eliminator is an auxiliary device which is mounted on the body of the arc welding generator. It is connected in series with the excitation field of the generator and controlled by a switch which enables the operator to cut it in and out of the excitation field circuit at will. It is thus possible to accomplish a tapering off or a fading of the current instead of an abrupt change. The weld deposit made under these conditions is free from porosity at the end, and has a smooth even contour instead of the typical depression.

Control of the "Stroco" Crater Eliminator is by means of a three-position button switch located on the electrode holder. During the usual progress of the weld, the switch is in the neutral position and the device is entirely inoperative. When the operator is about to break his arc either because he is approaching the end of one electrode or because he is approaching the end of a weld, he presses the button backward into the "ON" position of the switch housing. This brings the "Stroco" Crater Eliminator into play and causes the arc to fade out gradually until the arc voltage becomes so low that it can no longer deposit any metal. In any case where the sections of the parts being joined become smaller so that it is desirable to reduce the current density for a limited period, the button can be retracted to make a slight reduction in the welding current and then advanced into the "OFF" position so that the remainder of the weld can be completed with reduced current; or, if he wants to return to the original current, a release of the pressure on the button will let it swing into the neutral position, which in turn will cause an increase of the welding current to its original value.

» «

Electrode Pressure Gage

★ An **electrode pressure gage** designed to measure the pressure between the electrodes of resistance-welding machines has been announced by the **General Electric Co.** The gage is for use either as a standard for checking existing gages or pressure indicators on spot, line, or projection welders, or for checking the electrode pressure at the time of set-up, before proceeding with production work.

The new gage measures pressures from 0 to 4500 lb; an automatic stop safeguards it against damage, should pressures of more than 4500 lb be applied. Consisting simply of a calibrated steel yoke and a micrometer dial indicator, the gage is easily applicable to existing resistance welding machines without the need for jigs or other auxiliary equipment.

When electrode pressures are to be measured preliminary to production work, the gage is inserted between the electrodes so that they press on the pads on the top and bottom of the gage yoke. The electrode pressure is adjusted until the desired pressure is registered on the gage dial. The gage is then withdrawn and the welding machine placed in operation.

» «

The New Oscilloscope

(Concluded from page 26)

(*c*). Provision for direct observations of current or voltage characteristics.

(*d*). Light weight, sturdiness, and portability.

(*e*). Convenience in setting up on the job.

(*f*). Practically instantaneous resetting, therefore always ready for operation. Responds to all current pulses, even when seam welding is being done.

(*g*). Simplicity of operation and use.

It will be evident from the preceding examples of the use of this instrument that there are many other applications in which it could be used effectively in addition to the field of resistance welding. This field was selected because it demonstrates several typical uses.

THE END

News of the Industry

Found—A Number of Keys

On July 22 there was found on Michigan Ave., Chicago, a number of keys on a chain. Since this chain also carried a souvenir medal from the 1939 Golf Tournament of the Chicago AWS, the owner may obtain these keys by calling at *The Welding Engineer,* 506 South Wabash Ave., Chicago, Ill.

» «

New Research Laboratory

Continuing to expand its research and development activities, the **Metal & Thermit Corp.,** New York, N. Y., started the construction, on July 1st, of a new research laboratory at Rahway and Randolph Ave., Woodbridge, N. J. Occupancy is scheduled for November 15, 1941.

Located on a ten-acre tract of land, the new laboratory is one story in height and will have 16,000 square feet of floor space. It is modern in architectural treatment, one interesting feature being a continuous line of large windows around the entire structure. Steel, concrete, brick and hollow tile will provide fireproof construction.

The front section of the building will house administrative offices, library and analytical laboratories, as well as the chemical laboratories of the Ceramics and Detinning departments of the corporation. Two wings at the rear will be occupied by laboratories devoted to research on arc welding electrodes, Thermit welding and Thermit metals and alloys while a third wing will contain process and manufacturing development divisions.

Research activities of the Metal & Thermit Corp. are under the direction of **Dr. Lincoln T. Work,** formerly of Columbia University.

The **Central Steel and Wire Co.**, announce the removal of their offices to new and larger quarters at 3000 West 51st Street, Chicago.

» «

Recent changes in the Handy & Harman organization have brought **J. W. Colgan** formerly manager of **Handy & Harman of Canada Ltd.**, Toronto, back to New York in the capacity of Sales Manager of the parent company. Jack, as so many know him, is not a stranger to the trade in this country, having seen 17 years of service in the New York sales department before going to Toronto five years ago. He is taking charge of all company sales work connected with the silversmith and jewerly industries, as well as the growing industrial work in which the company is now engaged.

» «

Progressive Welder Co., Detroit, manufacturers of resistance welding equipment, has announced the establishment of eight branch offices and six additional offices are being provided by independent distributors handling sales and service on the Progressive Welder line.

Branch offices are in charge of the following men: Cleveland, **Frank Stockton,** 3730 Chelton, Shaker Heights; Dayton, **Frank Mackniesh;** Milwaukee, **K. W. Stoffregen,** 2874 N. 57th Street; Philadelphia, **D. J. Riddell,** S. W. Cr. 5th & Arch Streets; Pittsburgh, **Frank Stockton,** P. O. Box 43, McKees Rock; St. Louis, Mo., **Arthur Lewis.**

In addition, **R. C. Neal Co.** are providing sales and service facilities in Buffalo (76 Pearl Street), Syracuse (569 So. Clinton) and Rochester, N. Y. (46 Andrews). **Rudel Machinery Co. Ltd.** is servicing Canada with offices in Montreal, Toronto and Windsor, while **Ducommon Metals and Supply Co.,** is handling the Pacific Coast area with offices in Los Angeles and San Francisco.

Personals

The **American Institute of Steel Construction** has appointed **Joseph M. Marshall, Jr.,** as district engineer with headquarters at Atlanta, Georgia. Mr. Marshall will represent the Institute in the territory embracing Virginia, Eastern Kentucky, North Carolina, South Carolina, Tennessee, Georgia, Alabama and Florida.

» «

Ralph S. Beeler for 19 years with J. E. Haseltine & Co., Portland, Oregon, is now associated with **Paul Kullberg** of **Industrial Specialties Co., Inc.,** Portland, Oregon. Mr. Beeler becomes Vice President and Sales Manager of Industrial Specialties, Inc., distributors of welding supplies in Oregon and Southern Washington.

Arthur Madson, chief welding instructor at the Lincoln Electric Co.'s school of arc welding, recently suffered a broken leg while on a fishing trip near West Branch, Mich.

Mr. Madson is on the job again but on crutches. His crutches are unique in that they are of original design being made of ½ in. seamless steel aircraft tubing and fabricated by arc welding.

» «

Frank C. Neal, Jr. has been appointed district arc welding specialist for **General Electric's** Dallas district office according to an announcement by **C. I. MacGuffie,** manager of electric welding sales. In this capacity, for the General Electric Co., Mr. Neal will cover the states of Texas, Oklahoma, and part of Louisiana. He succeeds **N. M. Voorhies** who has been transferred to G-E's Chicago Office.

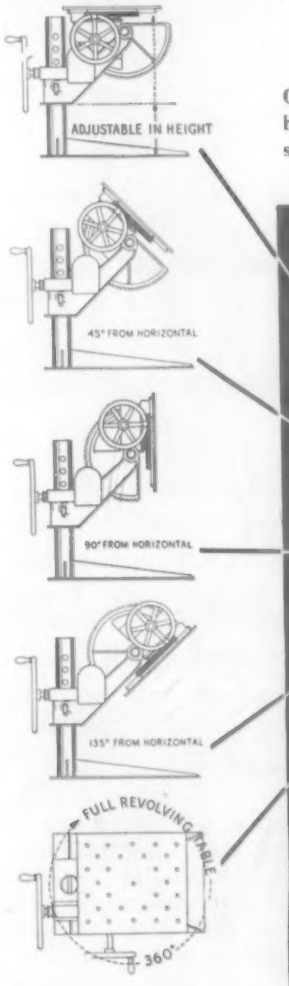
As G-E's arc welding specialist in the southwest, Mr. Neal's principal interest will be in the districts served by the **B & A Welding Supply Co.,** Tyler, Texas; **Briggs-Weaver Machinery Co.,** Dallas, Texas; **Fort Worth Welding and Supply Co.,** Fort Worth, Texas; **Hughes Welding and Supply Co.,** Shreveport, Louisiana; **San Antonio Machine and Supply,** San Antonio, Texas; and **Wessendorf-Nelms and Co.,** Houston, Texas.

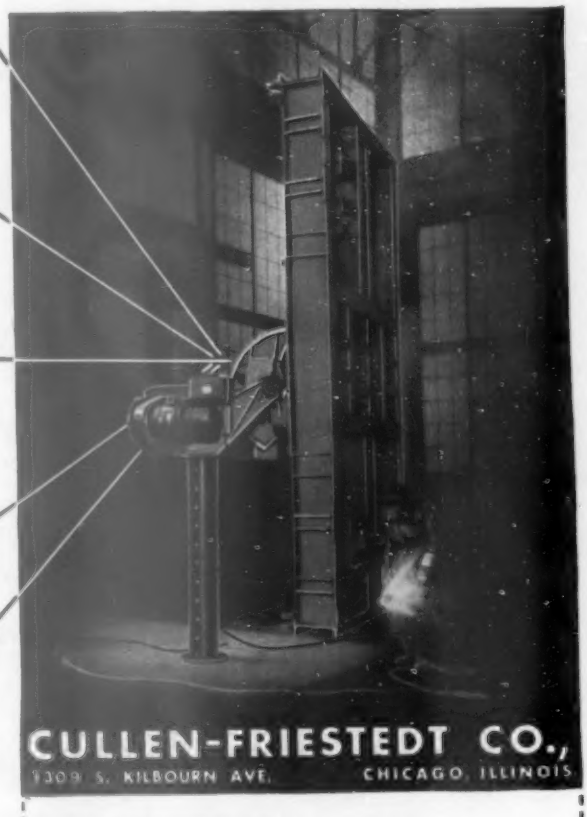
FIND OUT HOW MUCH

Faster, more economical welding and better welding you can do on a C-F Positioner

●

Our circular WP-20 is an interesting and informative booklet you should have about these machines which speed up production welding.





Mail this coupon today without any obligation whatever.

CULLEN-FRIESTEDT CO.
1309 S. Kilbourn Ave., Chicago

Gentlemen:
Please send me a copy of your circular WP-20.

Name .....

Firm .....

Title .....

Address .....

F. B. Shay, mining engineer of the **Foote Mineral Co.**, Philadelphia, is leaving for a trip to Cuba to investigate manganese, chrome and other mineral deposits.

» «

Philip N. Cooke, sales manager of **Norton Company of Canada, Ltd.**, Hamilton, Ont., has been appointed resident manager succeeding Robert C. Douglas who died May 29.

Mr. Cooke has been with the Canadian plant from its beginning, having left Worcester in June 1920 as one of the original Canadian-Norton organization. For the first few years he held the title of sales engineer but for more than 15 years his position has been that of sales manager. Previous to the Canadian assignment he was in the sales engineering department at Worcester for four years.

D. M. Chisholm of the Canadian sales organization succeeds Mr. Cooke as sales manager.

» «

E. J. Lassen has been appointed manager of General Electric welding sales for the New York District, according to an announcement by **G. H. Reid**, manager of the G-E New York District Industrial Department. He will work with **E. Vom Steeg, Jr.**, G-E welding specialist, and with the **Welding Engineering Sales Corp.**, G-E distributor, in serving northern New Jersey, New York state, and Connecticut. Previous to his new appointment, Mr. Lassen was engaged in welding application engineering work at Schenectady.

» «

J. C. "Jim" Blake former Vice President in charge of Victor Equipment Company's Southern California activities and one-time Naval officer, has re-entered the Navy and, now, as Lieutenant Commander, USNR is stationed with the Bureau of Ships, Welding and Casting Division, Washington, D. C. in a supervisory capacity.

While his many friends will regret his leaving Los Angeles, they will be glad to know of this important appointment. His former assistant, **Edwin O. Williams**, has now been advanced to the position of manager of the company's Los Angeles branch, and he will be assisted by **Leigh N. Call** as sales manager.

E. O. Williams

Mr. Williams has been with Victor for over ten years. Graduating from the University of Southern California in 1928 with a Bachelor of Science in Business Administration, he gradually advanced from stock room, to sales force, to office manager and to assistant branch manager. Mr. Call has been with the Victor organization for approximately eight years, during the last of which he was assistant sales manager at the company's home office in San Francisco.

» «

R. M. LeMaster and **C. O. Conzett**, two well-known Southern Californians in the heavy equipment and welding fields, have joined forces to organize a new welding supply company. This new organization will be known as **LeMaster-Conzett Co.**, 4439 Santa Fe Ave., Los Angeles.

This new organization will represent the Harnischfeger Corp. in Southern California as distributors of P. & H. Hansen Arc Welders and SmoothArc Electrodes.

TITAN—the Users' Assurance of Perfect Welding Results.

Trade Mark Registered

TITAN BRONZE WELDING ALLOYS

—preferred by experienced welders from coast to coast — are the result of many years of TITAN pioneering.

DOUBLE DEOXIDATION, developed by TITAN metallurgists, eliminates injurious gases and assures *increased ductility plus greater strength* in the weld deposit.

Our production facilities are being used to their utmost capacity to make available Titan products necessary to the Defense Program. We regret that these requirements are currently in such volume that until this program is completed it will be impossible to fill the requirements of new customers unless they bear a priority rating.

Send for newly-issued folder describing TITAN Alloys. No obligation.

TITAN METAL MANUFACTURING CO.
Bellefonte, Pennsylvania

Norton **Company,** Worcester, Mass., has announced the appointment of **Paul Fielden** director of purchases. Mr. Fielden has been connected with the company 21 years as assistant credit manager and credit manager.

John **Miller,** for a number of years assistant credit manager of Norton Co., succeeds Mr. Fielden as credit manager. **Marcus W. White** retains the position of purchasing agent, which he has held with the company for many years.

» «

Edwin Fisher, associated for the past thirteen years with the Cadillac Motor Car Co., and for the past four years Manager of Cadillac Jefferson Ave. Branch in the Detroit Area, has resigned from G. M. to join **Progressive Welder Co.** in an executive sales capacity.

In his new connection, Mr. Fisher will assist in the development of sales of Progressive Welder's resistance welding equipment in the middle Western area.

» «

Thomas F. Peterson has been appointed Director of Electric Cable Engineering & Research of **American Steel and Wire Co.,** subsidiary of the United States Steel Corp. His office will be located at the company's headquarters in Cleveland, where he will be connected with the office of the vice-president in charge of operations. Mr. Peterson joined American Steel and Wire Co. in 1927 as cable engineer in the New York office. Later he was promoted to electrical engineer, and in 1931 was transferred to Worcester, Mass. In January, 1937, he was appointed Director of Electrical Cable Works at Worcester, which position he has held until the present time.

Obituary

Robert C. Farrington, 59, chief mechanical engineer of the Austin Company, engineers and builders, since 1919, died at St. Joseph's Hospital, Fort Worth, July 15, following a heart attack. He had been associated with the company since 1918, when he joined the Austin organization as a mechanical engineer at the district office in Philadelphia.

A native of Lafayette, N. Y., Mr. Farrington attended grade schools at Cardiff, N. Y., and the Onondaga Academy. He was graduated from Syracuse University as an electrical engineer in 1903 and for the next two years was employed as engineer and estimator with W. N. Tobin in New York City. From 1906 to 1913 Mr. Farrington was engaged in professional engineering work, first in New York as a partner of Sorenson & Farrington, and subsequently in Syracuse under the name of Farrington & Berdsoll. In 1913 he became president and general manager of the York Engineering Company at York, Pa., and continued in that capacity until he joined the Austin organization.

Construction

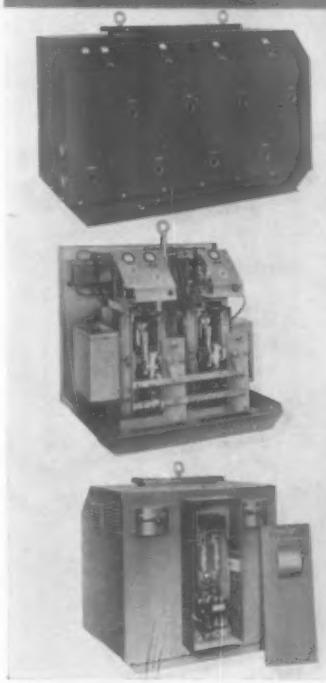
H. C. Price Co. of Bartlesville has been awarded contracts for electric welding of the following pipelines:

For **Natural Gas Pipeline Co.** of America—Additional river crossings in Iowa—General Contractor W. A. Bechtel Co.

For **Illinois Pipe Line Co.**—25 Miles of 8-inch and 10-inch near Enfield, Illinois — General Contractor Sheehan Pipe Line Construction Co.

For **Stanolind Pipe Line Co.**—133 Miles of 8-inch from Indianapolis, Indiana to Hammond, Indiana—General Contractor Sheehan Pipe Line Construction Co.

CUT INSTALLATION TIME & COST



with G-R SELF-CONTAINED MULTI-PURPOSE WELDERS *for*

- MANUAL . . .
- AUTOMATIC . . .
- UNIONMELT WELDING

• G-R Model 85, 2000-amp. Handles up to 4 hand lines.

• Model 65, case removed to show built-in power factor correctors, etc.

• Model 65, rear view, showing primary contactor and quick change-over switches for automatic-hand-multiline operation.

G-R welders from 300 to 2000 ampere capacity are available with built-in contactors, remote control facilities and power factor correctors. They even include a 3 KVA 440/110 v. transformer to provide power for thyrotron controls, vacuum cleaners, etc. Installation is simple, fast and economical. High efficiency (85-95%) means greater output without increasing your plant load . . . if you want to step up production, get the facts NOW about G-R units — just write or wire:

GLENN-ROBERTS COMPANY
1009 FRUITVALE AVENUE, OAKLAND, CALIF.
CHICAGO: 5651 W. OHIO STREET

The Improved "Round File" Gas Lighter

Immediate Ignition Assured

The Hood of the Improved "Round File" Gas Lighter is so designed as to form a "pocket" for the gas—an exclusive feature — which assures IMMEDIATE ignition. Get acquainted with the many other superior, exclusive features of Improved "Round File."

Circulars and prices on request.

SAFETY GAS LIGHTER CO. (Est. 1901) LYNN, MASS.

Current Reviews

Shear Bulletin

In a new 8-page bulletin, QW-100 entitled **"Quickwork Whiting Rotary Shears"** issued by the **Quickwork-Whiting Div.** of the Whiting Corp., Harvey, Ill., there is described the line of rotary shears manufactured by this concern. Shears for cutting all thicknesses of metal from 14 ga. to 1 in. are pictured and such details as power requirements, cutting speeds, sizes, capacities and weights are included.

Of interest to the welding industry is the claim that these shears will not only cut a welding bevel on plates—but serve the purpose of seven machines.

» «

Safety Circular

"Protection for the Eyes and Face" is the subject of a 4-page circular just released by **The Boyer-Campbell Company,** 6540 Antoine St., Detroit.

It features 20 different models of face shields, all interchangeable in parts with the exception of two; meaning one shield which through interchangeability of windows covers any industrial operation. This means "Less Inventory,"—12 different models for welding, as well as splash and heat protection. There is a ready reference to each of the illustrations, which gives complete information and specifications.

» «

Philadelphia Quartz Story

The **Philadelphia Quartz Co.,** Philadelphia, celebrated the 110th anniversary of the founding of the company on July 20th. Originally started in 1831 as a soap and candle business. In 1858 Thomas Elkinton, a son of the founder, began experiments with silicate of soda.

His experiments were so successful that the company finally discontinued the manufacture of soaps. Now, with the company in its third generation of Elkinton, is one of the largest producers of silicates making them in 33 different forms.

» «

Plug and Socket Catalog

A new 20-page catalog, known as No. 11, has just been released by **Howard B. Jones,** 2300 Wabansia Avenue, Chicago, illustrating and describing their complete line of multi-contact plugs and sockets, terminals, terminal panels, fuse mounts, etc.

It includes their "300," "400" and "500" series plugs and sockets, hundreds of terminal panels for every inter-connecting requirement, barrier strips, bulk terminals; and shows several new items recently added to the line.

A copy of this catalog will be sent free upon request to this publication or direct to HOWARD B. JONES.

» «

V-Belt Drive Data Book

A comprehensive data book covering all types of V-belt drive applications has been compiled and published by the **Fort Worth Steel & Machinery Co.,** Fort Worth, Texas, manufacturers of **Boltrim V-Belt sheaves** and agents for **"Goodflex" multiple V-belts.** This book, in addition to the usual data, contains full and detailed information concerning the "Boltrim," or demountable hub sheave. Complete specifications together with a list of sizes carried in stock are shown. According to the manufacturer, a Boltrim sheave is constructed in such a way that rims of varying diameters and face widths can be mounted. The rim is attached to the hub with heat-treated cap screws, making it possible to quickly and easily remove the rim without removing the hub from the shaft. Thus a rim may be replaced with a minimum loss of time. Special tools are not required.

This sixty-four-page book contains, aside from data on Boltrim rims and Goodflex belts, useful information on such things as ratios, load capacities, friction losses, etc. It will be mailed free upon request.

» «

Bronze Welding Alloys

Bridgeport Brass Co., Bridgeport, Conn., has just published a 16-page booklet **"Bronze Welding Alloys".** In addition to the list of bronze welding alloys available together with their physical prop-

Welding Rods . . . not too plentiful, BUT . . .

if you need stainless electrodes for defense work, alloy and hard surfacing rods or other electrodes for special, out-of-the-ordinary applications, we can probably help you. Call the nearest Ryerson plant.

Electrodes in stock include:

McKay Stainless—7 types

Ryerson Shielded Arc—9 types for Mild Steel and Alloys

Blue Coates—For Cast Iron

Phosphor Bronze—For Brass and Copper

Hard Surfacing—

Also a complete line of Acetylene Welding Rods for every application.

●

Joseph T. Ryerson & Son, Inc. Plants at: Chicago, Milwaukee, St. Louis, Cincinnati, Cleveland. Detroit, Buffalo, Boston, Philadelphia, Jersey City.

RYERSON

erties and applications, the booklet contains a brief but comprehensive description on the latest method for brazing cast iron and steel as well as for welding silicon copper tank stock. Every user of bronze welding rod should write for a copy. This booklet can be obtained by writing for it on your company letterhead.

» «

Welding Control Panels

Welding circuit control panels with basic ratings up to 300 amperes for constant potential multiple operator welding systems are described in a new 4-page folder announced by Westinghouse Electric and Manufacturing Co.

Enclosure types and general panel construction are described. Explanations of panel current rating and circuit controls are given with a note on resistor units used. Special combination panels for carbon and metallic arc welding are discussed.

A copy of catalog section **26-210** may be secured from department 7-N-20, **Westinghouse Electric and Manufacturing Co.,** East Pittsburgh, Pa.

» «

Welder Specifications

Shield-Arc Jr. Aircraft Welders are described in Welder Specification Bulletin No. 338 which was recently released by the **Lincoln Electric Co.,** Cleveland. In this 4 page folder there is described in detail both the 150 amp. and 200 amp model aircraft welders. In addition there are a number of photo illustrations of production applications of arc welding in the aircraft industry.

» «

Wire Feeder Bulletin

In a new bulletin entitled **"Let's Talk About Results", Moslo Machinery, Inc.,** Cleveland, describe and discuss the pertinent features of the Moslo Automatic Wire Feeder. In this 4 page bulletin both the Model 1-F and 2-F are discussed and detailed specifications of these two Automatic Wire Feeders are given.

» «

Wire Reel Folder

Moslo Machinery, Inc., Cleveland, has just released a 4 page folder describing their new **Shiftweight** Counter balanced tilting wire reels. This completely illustrated folder points out the outstanding features and gives the specifications of the two models of Shiftweight reels as well as describes other type reels.

» «

Insulating Compound Catalog

A new forty page illustrated catalog describing **Insulating Varnishes and Compounds,** their physical and electrical properties and their applications has just been released by **John C. Dolph Co.,** Newark, N. J. In addition to the above information, this new issue of their catalog also describes many new insulating materials.

Steel Erection Booklet

The **J. H. Williams Co.,** Buffalo, N. Y., announce the publication of a 42 page spiral bound booklet entitled **"Saxe Welded Erection System**—Engineering Manual of Recommended Practice."

This booklet contains a description of the Saxe seat and clip and instructions as to their use. There is also included detailed drawings of welded connections assembled with the Saxe seats and clips.

Another interesting section of the booklet contains standard welded web angle beam connection—Equivalent of A. I. S. C. 1940 Standard Riveted Beam Connections. This booklet is priced at $1.00.

Direct-Current Motors

Direct-current motors for service in mines, mills and general industry is described in a new 8-page booklet announced by the **Westinghouse Electric and Manufacturing Co.**

Several recent improvements; namely, sealed-sleeve bearings, rigid frame-and-foot design, directed ventilation, and adjustable brushholders are discussed along with a pictorial description of each.

A copy of **descriptive data 4004** may be secured from department 7-N-20, Westinghouse Electric and Mfg. Co., East Pittsburgh, Pa.

A YEAR'S DELAY SAVED BY BRONZE WELDING!

Fractured spokes of 24 ft. flywheel repair welded with Anaconda 997 Low-Fuming Bronze Rod in 56 man hours

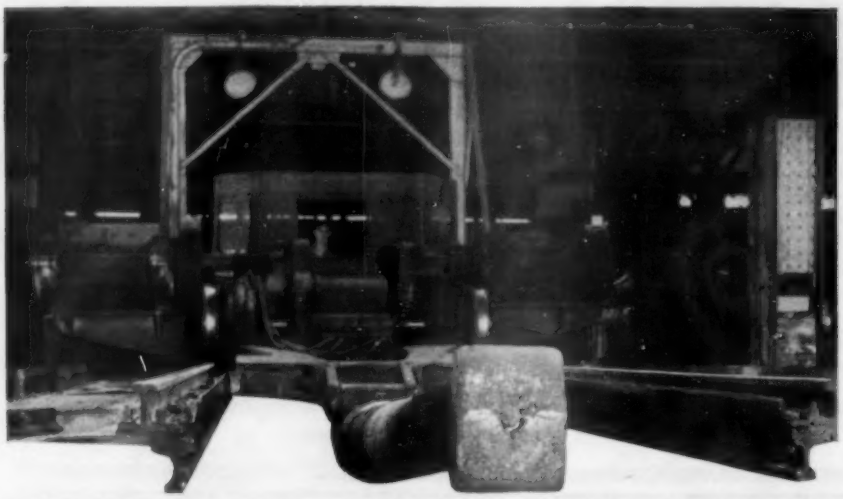
When two spokes of this giant flywheel were broken, it appeared as though a blast furnace with scheduled defense production would be out of operation for a long time.

The Hebeler Welding Company, Buffalo, was called in as soon as it was learned that a new wheel probably could not be delivered for a full year.

In just 56 man hours, the Hebeler men completed the job with about 300 pounds of Anaconda 997 Low-Fuming Welding Rod. An insurance company then insured the repaired wheel, which once again proves the statement that good workmanship plus a good material equals dollars —and time—saved! 41197

ANACONDA *Anaconda Welding Rods*

THE AMERICAN BRASS COMPANY, General Offices: Waterbury, Connecticut
Subsidiary of Anaconda Copper Mining Company
In Canada: ANACONDA AMERICAN BRASS LTD., New Toronto, Ont.



READY TO TAKE ABRASION IN 3,000° F!

This device, known as a "peel," is used for charging steel scrap into open hearth furnaces where temperatures hover around 3,000° F. The "peel" itself reaches operating temperatures of 1200° to 1400° while taking heavy abrasive wear.

RESURFACED BY WELDING WITH "HCPF"

It's one of the P&H special purpose electrodes — a medium high-carbon steel with a machinable deposit having high resistance to abrasion — even at these high temperatures.

This user states, "Since using 'HCPF,' peels are only resurfaced about once a month where they had to be resurfaced once or twice a week before."

This is typical of the way P&H answers many special welding problems through this advanced line of welding electrodes.

● *Resurfaced with "HCPF," this peel lifts and rotates pans of scrap steel with total loads up to 5500 lbs.*

For literature on P&H Welding Electrodes, see your nearest P&H distributor or write us direct.

General Offices: 4513 West National Avenue, Milwaukee, Wisconsin

HARNISCHFEGER CORPORATION

WELDING ELECTRODES • MOTORS • HOISTS P&H ELECTRIC CRANES • ARC WELDERS • EXCAVATORS

Power Assembly Tools

Black & Decker Mfg. Co., Towson, Md., has just published another in its series of Handbooks—a 56-page Data Book on Power Assembly Tools: **Portable Electric Screw Drivers, Nut Runners and Tappers.**

This book contains a wealth of information, not only on Power Assembly Tools but valuable information as to sizes of pilot holes; bolt, nut, cap screw and lag screw sizes; socket wrenches; tap drill sizes, etc.

» «

Norton Co. History

"Salute! Mr. Norton" is the title of a 16 page booklet commemorating the building of the 25,000th Norton Grinding machine by the **Norton Co.**, Worcester, Mass. Dedicated to Charles H. Norton, 89 year old retired inventor of the Grinding machine and aside from giving a historical background of the Norton Co. highlights the company's employees and various company sponsored employee activities.

» «

Flooring Handbook

"New Ideas in Functional Floor Design" is the title of a 16-page handbook on the many uses of open steel floor grating just published by the **Open Steel Flooring Institute.** The handbook has been prepared by the Institute to provide detailed technical and working knowledge of the several types of open steel floor grating riveted, welded and interlocked, manufactured by its members.

Included in its contents are a Table of Safe Loads based on U. S. Government specifications—a typical hypothetical floor layout—detailed clipping or fastening diagrams—suggested specifications. Dozens of illustrations of open steel flooring installations show the wide range of application of the product.

A copy of "New Ideas in Functional Floor Design" may be secured free of charge by writing The Open Steel Flooring Institute, American Bank Building, Pittsburgh, Pa.

» «

Welding Slide Rule

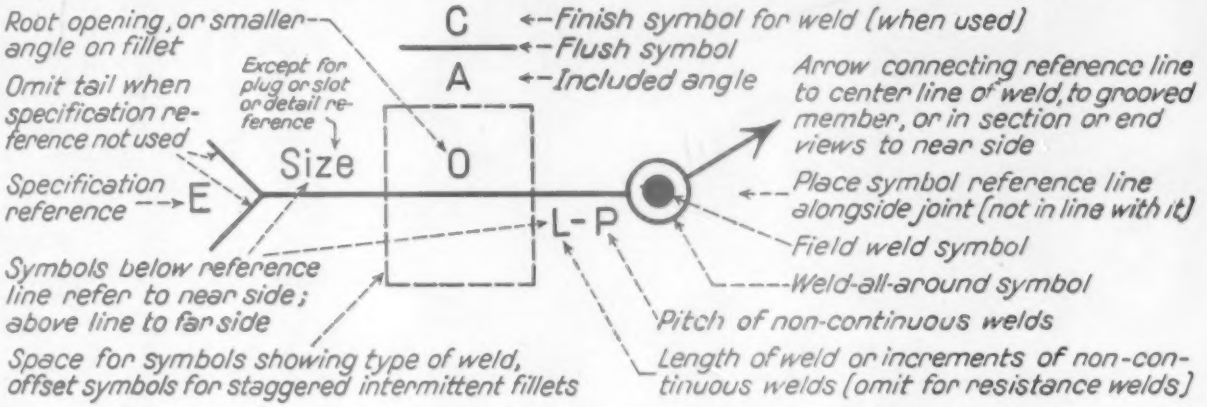
Engineers, supervisors, purchasing agents, operators, and all others who use or supervise the use of arc welding electrodes will find the new General Electric Arc Welderule saves time in estimating electrode requirements. Operating in a manner similar to a slide rule, the Arc Welderule reads directly the length of arc welded joints obtainable per 100 lb. of electrode, also the pounds of weld metal deposited per 100 lb. of electrode. The information covers 11 different commonly used sizes and types of joints; also 22 different sizes and types of popular electrodes in both the 14- and 18-inch lengths.

An additional feature of the Arc Welderule is a **selector chart** which shows the various filler metal classifications as specified by the American

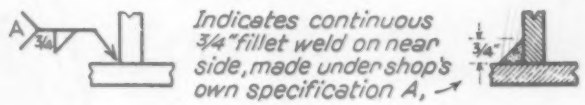
Welding Symbols*

For Fusion Welding								For Both			For Resistance Welding			
Type of Weld											Type of Weld			
Bead	Fillet	Groove					Plug & Slot	Field Weld	Weld All Around	Flush	Spot	Projection	Seam	Butt
		Square	Vee	Bevel	U	J								
⌒	◺	|	V	V	Y	V	▽	●	○	—	✳	✕	XXX	|

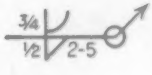
Standard Location of Information on Welding Symbols


Root opening, or smaller angle on fillet
Omit tail when specification reference not used
Specification reference
E
Except for plug or slot or detail reference
Size
O
C
Finish symbol for weld (when used)
Flush symbol
A
Included angle
Arrow connecting reference line to center line of weld, to grooved member, or in section or end views to near side
Place symbol reference line alongside joint (not in line with it)
Field weld symbol
Weld-all-around symbol
L-P
Pitch of non-continuous welds
Length of weld or increments of non-continuous welds (omit for resistance welds)
Symbols below reference line refer to near side; above line to far side
Space for symbols showing type of weld, offset symbols for staggered intermittent fillets

Significance of Typical Combinations



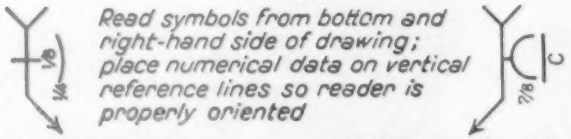
Indicates continuous 3/4" fillet weld on near side, made under shop's own specification A,



Significance: Weld all around (encircling member as far as possible). Near side: 1/2" fillet, 2" long, 5" on centers. Far side: plate has 3/4" J groove (shop's standard), continuous weld

3/8" fillet weld both sides for 6". Welds on both sides are same size unless noted

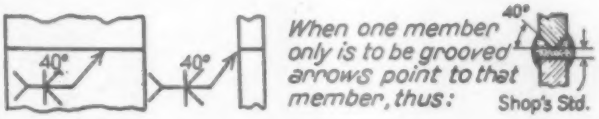
3/8" fillet welds 2" long, 4" on centers, opposite sides staggered



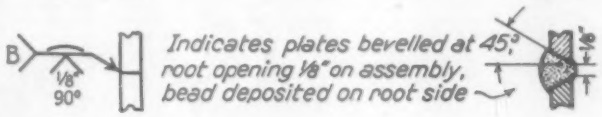
Read symbols from bottom and right-hand side of drawing; place numerical data on vertical reference lines so reader is properly oriented

Significance: Square edges on plates clearing 1/8", welded from near side, 1/4" penetration required

Significance: Closely abutting plates with U groove 7/8" deep, near side chipped smooth

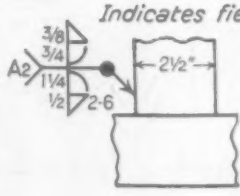


When one member only is to be grooved arrows point to that member, thus:

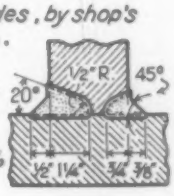


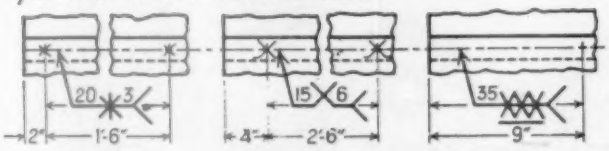
Indicates plates bevelled at 45°, root opening 1/8" on assembly, bead deposited on root side

Symbols govern to break in continuity of structure or to extent of hatching or dimension lines. Strength of resistance welds in hundreds of pounds noted instead of size:



Indicates field weld both sides, by shop's specification A_2. Vertical plate: double J groove. Weld far side: continuous. Near side: 2" long, 6" on centers





2000-lb. spot welds, @ 3" centers

1500-lb. projection welds @ 6" centers

3500-lb. seam weld, 9" long, flush near side

For other combinations see "Welding Journal", June 1937

*adopted as standard by the American Welding Society, 1937.

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Recent Patents

Welded Pressure Vessel

2,244,064. **James C. Hodge**, Barberton, Ohio, assigned to the **Babcock & Wilcox Co.**, Newark, N. J. Filed June 10, 1937. Issued June 3, 1941. This invention involves a method of fusion welding a pressure vessel in a manner to withstand extremely low temperatures at elevated pressures. Such vessels are used for dewaxing oils. A former obstacle to the development of such vessels has been that the great size of such vessels substantially precludes heat treatment for normalizing. The patentee has found that a suitable low temperature material is 3½% nickel steel. This steel is used for the general wall area of the vessel. When this steel was united by a fusion deposit of similar straight nickel steel great difficulty was experienced in producing uniform results and a sound weld, since cracks formed in the weld deposited metal, probably due in part to air hardening tendencies rendering the metal partially martensitic, and also due to a probably critical brittle temperature range through which the deposited metal passes when cooling. By using a dissimilar metal, such as nickel-molybdenum steel, these difficulties are avoided. The resultant weld deposit is free of a critical brittle temperature range. The deposit need not be normalized.

» «

Electric Contact

2,244,455. **Fritz Gengenbach**, Attleboro, Mass., assigned in part to **William J. Reilly**, Attleboro, Mass. Filed Sept. 21, 1939. Issued June 3, 1941. Ordinary spot welding machines employ rigid contacts or welding tips. One or both of these is pressed against material to be welded. If the material to be welded is irregular in form the contact made may be loose in part or irregular. This may produce a variation in the heat of the area affected and may discolor, deform or otherwise impair the material. The contact of this invention is adapted to procure accurate, full and complete contact. To this end one of the contact points may consist of a liquid contact member which may be brought into close and complete contact with the material. A convenient liquid is mercury which forms not only a good contact but is in itself a good conductor of electricity. The new contact includes a contact element, a resiliently supported sleeve on the contact element, a resilient collar on the end of the sleeve and against which the work pushes to depress the sleeve, and mercury above the contact element within the sleeve and adapted to come into contact with the work when the sleeve is depressed.

» «

Electric Welder

2,244,508. **Edmund J. von Henke** and **Arthur A. Grothe**, Chicago, Ill., assigned to **American Electric Fusion Corp.**, Chicago, Ill. Filed Nov. 13, 1939. Issued June 3, 1941. The apparatus of this patent employs a hydraulic piston for applying pressure to the electrodes. Automatic starting of the flow of welding current at any predetermined electrode pressure is provided. In addition, the new machine requires no adjustment for ordinary variations in the thickness of the work. The time of welding is controlled by a timer independently of the speed of operation of the machine.

» «

Electrode Tip Puller

2,245,838. **Richard H. Taylor**, Greens Farms, Conn., assigned to **Electroloy Co.**, Inc., New York, N. Y. Filed Sept. 21, 1940. Issued June 17, 1941. An electrode welding-tip puller is shown for removing a welding-tip from the holder in which it is secured by reason of the fact that the tapered end of the tip is seated in a similarly tapered hole in the holder. In practice, in removing welding tips from their holders, it has

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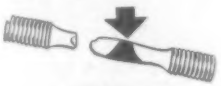

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been customary either to twist them out with a wrench or pliers, or to knock them out from the side with a cold chisel and hammer, or to remove them by other more or less violent methods. Such methods are likely to distort the tapered hole in the holder. The new puller includes gripping jaws to engage the welding tip, the jaws being pivotally mounted on pinching elements. On the outside of the jaws a washer is supported. This washer is adapted to surround the tip and lie against its holder. Cams on the pinching units serve to engage the washer so as to permit the tip to be removed while the washer pushes against the tip holder. The gripping jaws are in the form of half cylinders adapted to surround the tip and hold it by means of gripping ridges.

» «

Portable Welding Gun

2,245,920. **Albert D. Jardine** and **Harry V. Beronius,** Detroit Mich. Filed Sept. 5, 1939. Issued June 17, 1941. It is pointed out in this patent that in ordinary electric welding guns the work must reside between an anvil and a movable element in response to hydraulic pressure, the anvil and the movable element acting as electrodes. In the novel gun of the invention no anvil is employed and the pressure for controlling the welding function is that caused by the operator in pressing the gun against the work. The gun is so constructed that the operator may place it against his shoulder in order to conveniently apply pressure thereon. The controls which cause the weld to take place function under a predetermined pressure. The controls are adjustable. The unit includes a portable body having pressure applying means, a push rod slidably situated in the portable body and biased by a coil spring. An electrode is mounted on the push rod and a switch mounted on the portable body is actuated by the relative movement between the push rod and the body. Provision is also made for removing the heat generated by welding operations.

» «

Welding Circuit

2,246,304. **Harold C. Jenks,** Wilkinsburg, Pa., assigned to **Westinghouse Electric & Mfg. Co.,** Pittsburgh, Pa. Filed Nov. 6, 1937. Issued June 17, 1941. It is desirable to restrict the welding current to a certain number of half cycles, depending upon the type of weld desired. In mass production, it is desirable that these numbers of half cycles be readily available to workmen who may be skilled in the application of the welding contacts to the work or load, but not skilled in the electrical apparatus that produces these groups of half cycles. It is convenient to have a welding timing circuit to apply on and off periods comprising the predetermined and desired group of half cycles. It is pointed out in the patent that it is highly desirable to provide that the weld be made with one group and not with a plurality of groups of half cycles. The invention contemplates that the workman depress the switch for his particular bench line, and that the weld will utilize only one group of the desired half cycles. By means of the invention the weld will not be overshot with more than one group of the desired half cycles. It will be necessary for the workmen to remove the switch in order to get another application of the welding current to the welding contacts. Suitable relays are employed in the invention.

» «

Butt Strap

2,246,579. **Eric H. Ewerts,** Elizabeth, N. J. Filed June 4, 1938. Issued June 24, 1941. In welding together the edges of adjacent plates, as for example those provided for the hulls of boats, or for tanks and similar structures, severe stresses are set up either in the welded joints or in the plates adjacent to the welds. If the plates are not free to move there is danger of rupture in either the welds or the plates caused by the cooling or contracting stresses, in which case the joint is liable to failure. The butt strap of this patent is adapted to be interposed between the edges of adjacent plates to be welded, the strap being constructed and arranged to move in a manner to increase the spread between its opposite longitudinal edges. The strap is also free to provide for longitudinal contraction as the weld progresses. As the welded joint cools no contracting stresses are set up which might tend to fracture the joint or plates. The butt strap has a continuous arcuate intermediate portion which is placed between the edges to be welded together. Actually the arcuate section is welded to the edges of the work. The strap terminates in reinforcing flanges which are free to spread relatively to each other to relieve stress in the welds.

» «

Welding Rod

2,245,566. **John W. Bolton,** Hamilton, Ohio, assigned to The **Lunkenheimer Co.,** Cincinnati, Ohio. Filed Feb. 2, 1940. Issued June 17, 1941. To produce a hard, corrosion resistant weld, having 500 to 600 Brinell hardness, a weld rod is used which comprises an alloy of nickel, chromium and silicon, the silicon being in the proportion of 6 to 12%, the chromium in the proportion of 9 to 30%, and the balance nickel. The greater the amount of silicon, the higher is the

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range of hardness. The ratio of nickel to chromium should not be more than ten to one and not less than two to 1. By age hardening heat treatment the weld deposit can be hardened to about 650 Brinell.

» «

Hydraulic Welder

2,246,806. **William H. Martin,** Detroit, Mich. Filed May 8, 1936. Issued June 24, 1941. To eliminate hammering of welding points against the work a novel hydraulically operated reciprocating tool has been devised, wherein a welding point is moved according to the movement of a liquid in the tool. The welder has a pivotally supported welder bar which engages the work, and an electrical conductor for connecting the work to the welding current. The welder bars are connected to the cylinder and piston parts of the hydraulic tool.

» «

Ground Clamp

2,247,282. **Andrew L. Webb,** Beaumont, Texas. Filed Nov. 20, 1939. Issued June 24, 1941. A ground clamp is described which can be quickly attached to almost any thickness of metal plate, rod or pipe, and which instantly provides a positive connection which cannot become loose or cause excess wear on the welding machine. The clamp includes two metal elongated strips having beveled edges at their gripping ends. The other end of one of the strips has a loop through which the second strip passes. The second strip has attached a current cable at its non-gripping end. The loop through which the second strip passes serves as a pivotal point for the two gripping arms. A coil spring mounted on a bolt passing through both strips imparts necessary bias to resiliently secure the two strips or arms.

» «

Welding Rod

2,248,104. **Louis G. Marini, Jr.,** Pittsburgh, and **David F. Helm,** York, Pa., assigned to **The McKay Co.,** Pittsburgh, Pa. Filed April 22, 1938. Issued July 8, 1941. The rod of this patent has a coating bonded with a binder containing a heat-hardened thermo-setting resin. The most common examples of such resins are of the phenol-aldehyde and urea-formaldehyde types. The resins may be employed in a liquid or in a dissolved form. The resin may have other binding materials mixed with it. The resins furnish carbonaceous material to produce a protective or reducing atmosphere. The resins also give good adhesion to the welding rod, as well as flexibility to the coating.

» «

Thermostable Weld

2,248,279. **Agostino Nepoti,** Sesto Calente, Italy. Filed Aug. 18, 1939. Issued July 8, 1941. An electric arc welding rod consisting of an iron alloy containing 0.15% to 0.20% carbon, 1.0% to 1.8% manganese, 0.1% to 0.4% silicon, 0.30% to 0.8% molybdenum, 0.6% to 1.0% chromium and 0.3% to 0.8% vanadium; produces a weld having a high tensile strength and having a resistance to thermal action occurring during the welding operation.

» «

Welding Stainless Steel

2,242,691. **Roy M. White,** South Pasadena, Calif. Filed May 9, 1938. Issued May 20, 1941. An apparatus is disclosed for welding stainless steel and other highly resistant metals in such a manner as to avoid destroying the temper of the metals. It is pointed out that there is a definite relation between the value of the welding current, the pressure applied to the work and the duration of the welding current. In order to prevent undue heating of the parts and a consequent destruction of the temper, it is desirable to apply a relatively heavy welding current to the work for a relatively short time. An adjustable timer is employed for accurately measuring the welding period. In addition, suitable pressure controlling elements are used.

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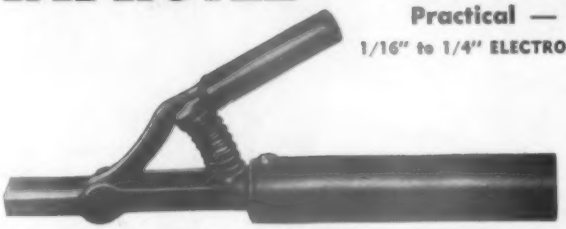

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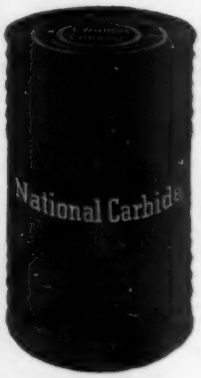

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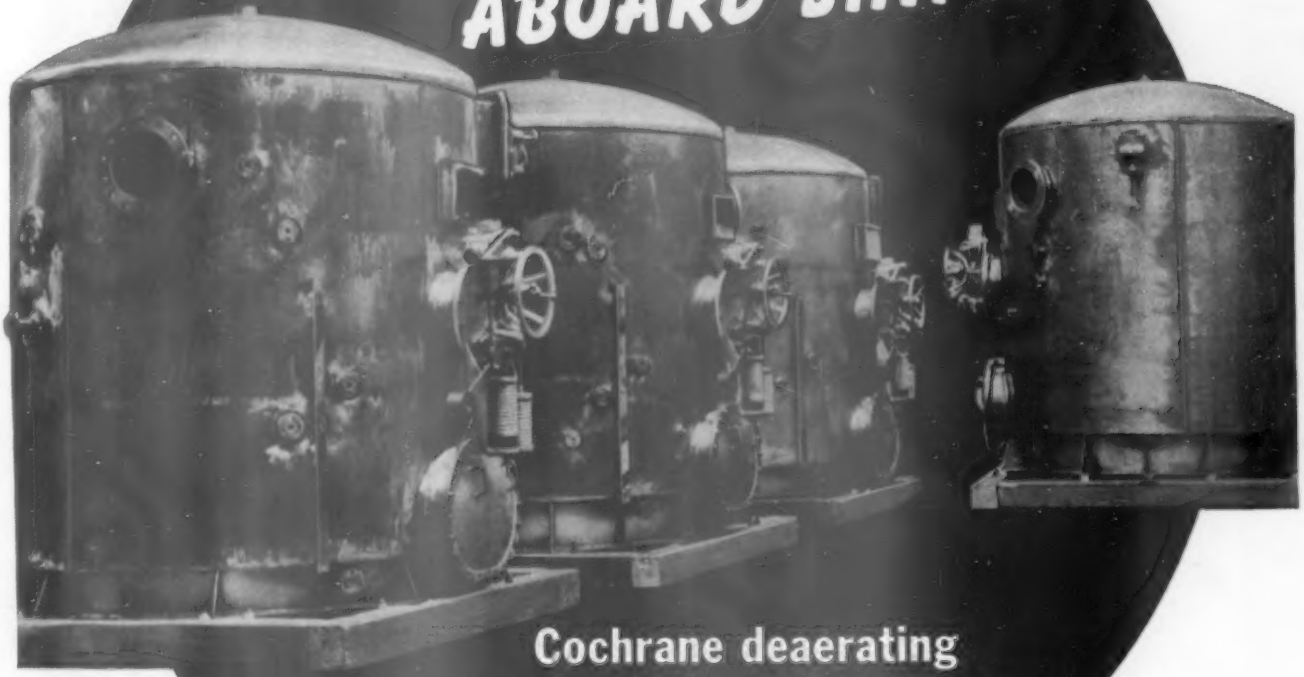

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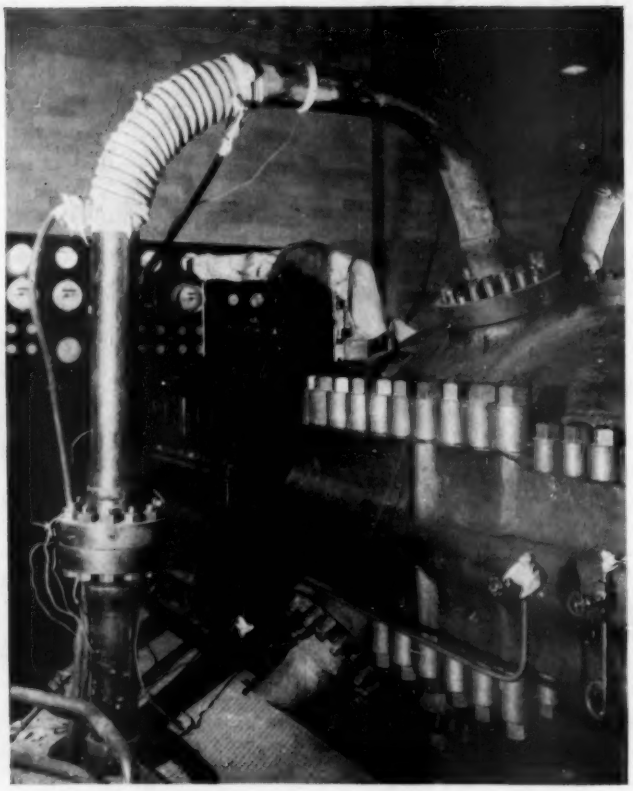

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